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CLASS ENVIRONMENTAL ASSESSMENT DOCUMENT

Expansion or Upgrading of an Existing Sewage System

OCTOBER 1979

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Figure 1 shows a schematic diagram of the experimental setup. A subject is seated at a table, viewing a video screen. A camera is positioned above the screen. A target is placed on the table. A ruler is used to measure the distance from the subject's hand to the target. The distance is labeled as 10 cm.

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Ministry
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Environment

CLASS ENVIRONMENTAL ASSESSMENT DOCUMENT

Expansion or Upgrading of an Existing Sewage System

OCTOBER 1979

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Rec'd from Peter Seto Feb 5/82

Peter was to prepare comments directly to E.A.P.

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INTRODUCTION

This document is a *Class Environmental Assessment* submitted to the Minister of the Environment in accordance with the provisions of The Environmental Assessment Act, 1975. It applies to a group of projects** which result in the expansion or upgrading of existing sewage systems.* The Project Co-ordination Branch of the Ontario Ministry of the Environment is the proponent of such projects.

Part I of the document provides *Background Information* on the projects in this Class. It explains the general characteristics of the undertakings and the problems they would remedy. It describes other ways or options that could be used to accomplish the Ministry's objectives in place of an expansion or upgrading project in this Class. It discusses the alternative design and construction methods that may be considered to actually carry out an expansion or upgrading project. Part I also explains the circumstances in which an individual Environmental Assessment may be required for a project in this Class.

Part II generalizes the *Design Process* for the numerous projects in this Class. It outlines the engineering and associated environmental work flow and the technical review and approval activities necessary to implement an undertaking. The involvement of the public and of government agencies in the design process is also discussed.

Part III deals with the *Environmental Study Report* which will be written for each expansion or upgrading project in this Class. It describes the format of this report and provides a typical outline of what it should contain.

The *Appendices* to the document provide supportive and explanatory information necessary for complete review and utilization of the document. Typical environmental concerns associated with the undertakings are indicated and examples given of remedial measures to mitigate adverse environmental condition changes. A description is provided of environmental considerations to be taken into account in construction of such projects, and relevant provincial legislation, regulations and guidelines are listed. Existing sewage collection and treatment systems are illustrated and described, and technical terms are defined and explained.

This Class Environmental Assessment document is a commitment by Project Co-ordination Branch, Ministry of the Environment to a consistent line of action in undertaking the design and construction of expansion or upgrading projects. It is also a commitment to accept responsibility for

* Note: This document does not apply to any expansion or upgrading projects for existing sewage systems which are undertaken by Ontario municipalities.

** The words "undertakings" and "projects" are used interchangeably throughout this document.

the development and implementation of measures to mitigate any adverse environmental condition changes associated with any project in this Class.

This document serves as a guideline for:

- . Project Co-ordination Branch personnel in the implementation of programs to expand or upgrade sewage systems in accordance with the Environmental Assessment Act, 1975; and
- . interested individuals, groups and agencies, in their monitoring of this Ministry's activities in this Class of undertakings.

Through submission of this document, Project Co-ordination Branch is requesting approval to plan, design and construct expansion and up-grading projects without subsequent individual approvals under the Environmental Assessment Act, 1975. This approval is subject to Project Co-ordination Branch's commitment to prepare and submit an Environmental Study Report for each project in this Class and to the conditions outlined in Section I-8 "Provisions for Requiring an Individual Environmental Assessment for a Project in this Class." The projects in this Class will remain subject to any other approvals as may be required under legislation other than The Environmental Assessment Act, 1975.

As a further condition of approval of this document, Project Co-ordination Branch commits to undertake a re-evaluation of this Class Environmental Assessment and submit a revised document for review under The Environmental Assessment Act before January 1st of the fourth complete year after approval. It is therefore recommended that the Minister grant Project Co-ordination Branch authority to proceed with projects in this Class until the earlier of the date on which approval of the revised document is received or January 1st of the fifth complete year after approval of this Class Environmental Assessment.

PART I - BACKGROUND INFORMATION

I-1 CONTENTS OF PART I

This part of the document explains the reasons for considering these expansion or upgrading projects as a group or Class, provides a general description of the characteristics of the projects and describes the type of problems these projects would resolve. It also describes alternative types of projects that could be considered for resolving these problems.

Alternative design and construction methods are outlined and an explanation is given of the circumstances in which an Individual Environmental Assessment may become necessary for a project normally in this Class.

I-2 RATIONALE FOR ADOPTING THE CLASS ENVIRONMENTAL ASSESSMENT APPROACH

The Environmental Assessment Act permits a proponent, such as Project Co-ordination Branch, to prepare environmental assessments for undertakings subject to the Act on either an "individual" or on a "class" basis. Approval of this *Class Environmental Assessment* would allow the design and construction of any project in this Class to proceed without subsequent approvals by the Minister of the Environment and the Environmental Assessment Board with respect to the provisions of the Environmental Assessment Act, 1975.

The projects covered by this document, when taken as a group, can be described as expansions or upgradings of existing sewage systems. Project Co-ordination Branch considers that this group of projects merits consideration as a Class undertaking because of important characteristics which the individual projects have in common:

- . the projects are proposed to solve a common problem or achieve a common goal;
- . they occur frequently and apply only to existing sewage systems;
- . the process of design and construction is basically the same for projects of this type;
- . the projects in this Class generally result in predictable, relatively minor, local environmental condition changes.

I-3 DESCRIPTION OF THE UNDERTAKINGS

Projects within this Class can generally be described as expansions to or upgradings of *existing* sewage systems. For the purposes of this document an *expansion* refers to the addition of new equipment, facilities or management practices to increase system capacity. An *upgrading* consists of additions or replacements to existing equipment, facilities or practices which are intended to achieve a higher level or quality of system performance, while not increasing system capacity.

In an individual problem situation it may be necessary to solve the problem or meet the need by employing either an expansion solution or an upgrading solution, or both.

An overview description of the typical components of a sewage system is given below to assist the reader in identifying where undertakings within this Class would fit within the total system. As well, the following material and that appearing in Appendix I provides the required "Description of the Undertaking".

Sewage System Components

The sewage systems in operation in Ontario are comprised of three basic components, *collection* and *treatment* of raw sewage and *management* of sludge wastes. The following lists the principal facilities and management practices associated with each of these components.

The *collection* component of a sewage system collects raw sewage from a source and delivers it to the treatment component via one or more of the following:

- . gravity sewers
- . vacuum lines
- . low pressure lines
- . pumping stations
- . forcemains

These facilities are described and illustrated in Appendix I.

The *treatment* component consists of one or more of the following facilities:

- . an individual septic tank and tile field
(servicing one sewage discharge point)
- . a communal septic tank(s) and tile field(s)
(servicing a number of sewage discharge points)
- . a Sewage Treatment Plant (STP) providing what
is called "Primary" treatment
- . a lagoon or 'waste stabilization pond'

- . an STP providing "Secondary" treatment with or without Primary treatment
- . an STP providing Secondary *and* "Tertiary" treatment (it may or may not also include Primary treatment).

Each of the above treatment facilities uses different processes and requires different sets of equipment. These processes and equipment are illustrated in Appendix I. All STP's and lagoons produce wastewater and, in addition, all STP's produce sludge (i.e. the "solids" removed from sewage).

The *sludge management* component consists of one or more of the following facilities or practices:

- . *disposal* of sludge at a licensed sanitary landfill site
- . *disposal* of sludge by burning it in an incinerator
- . *utilization* of sludge by applying it to soil conditioning sites (agricultural fields)
- . *utilization* of sludge by composting
- . a sludge transfer station to store sludge on a temporary basis

The above facilities and practices are further explained in Appendix I.

For the purposes of this *Class Environmental Assessment* an expansion or upgrading project may include one or more of the following changes to an existing system:

1. extension or upgrading of sewers (gravity sewer, vacuum line, low pressure line)
2. expansion or upgrading of pumping stations
3. expansion or upgrading of communal subsurface disposal facilities
4. expansion or upgrading of sewage treatment plants
5. expansion or upgrading of lagoon systems
6. a change in management practices and/or facilities for the disposal or utilization of sludge

Alternative methods of carrying out each of the above changes are discussed in Section I-7.

Most projects in this Class will alter the physical characteristics of the respective sewage systems by requiring, for example:

- . construction of new buildings or additions to existing buildings;
- . acquisition of additional land area to house the facilities, either at existing sites or new locations;
- . extension of existing sewer easements;
- . acquisition of additional land area to maintain the appropriate "buffer zone" between adjacent uses and the treatment facilities.

I-4 PURPOSE OF THE UNDERTAKINGS

The projects in this Class will be proposed to resolve problems affecting the operation and efficiency of existing sewage systems and/or to accommodate future growth of communities.

Projects in this Class will be proposed to achieve one or more of the following six general objectives:

1. to reduce public health problems or nuisances
2. to improve the quality of effluent produced by the sewage system
3. to improve the management of sludge waste produced by the system
4. to expand the capacity of the sewage system
5. to prevent system failure
6. to accommodate design improvements or new technology

The specific purpose for any one expansion or upgrading project is developed in the design process and documented in an Environmental Study Report for that project.

I-5 RATIONALE FOR THE UNDERTAKINGS

The purpose or objective of a specific project in this Class will be determined by the present or forecasted problem(s) affecting the operation and efficiency and the present or forecasted demand for increased system capacity. These specific problem(s) or demand(s) will form the *basis of need or rationale* for that project. The full rationale for an expansion or upgrading project will be developed in the design process and detailed in the Environmental Study Report for that project.

The following subsections describe the types of problems and demands which singularly or in combination may comprise the rationale for an expansion and/or upgrading project.

1. Problems Associated with Public Health

The well-being of human life may be affected by, or nuisances caused by such problems as:

- . contamination of groundwater supply used for human consumption, livestock watering or irrigation, e.g. due to "exfiltration" or leakage of raw sewage from sewers due to improper location and construction or insufficient maintenance
- . contamination of surface water supply used for human consumption, livestock watering or irrigation, e.g. due to repeated breakdowns at the treatment facility resulting in discharge of inadequately treated effluent to the receiving water body
- . failure to meet air quality requirements at sludge incinerators, e.g. due to poor construction/operation; changes in the constituents of the sludge to be burnt; changes in emission criteria
- . failure of the system resulting in the backup of raw sewage through the sewers into basements
- . odour from the sewage treatment facilities, or from a sludge transfer station
- . noise from operation of a pumping station or from the Sewage Treatment Plant
- . traffic hazards, nuisance or noise from trucking of sludge

2. Problems Associated with Effluent Quality

Objectives for water quality in all water resources in the province have been established.* These objectives include criteria governing

* Refer to "WATER MANAGEMENT - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment", Ministry of the Environment, November 1978.

the physical and inorganic characteristics of water bodies (e.g. temperature, dissolved oxygen, chlorine, phosphorous) and the allowable concentrations of heavy metals and pesticides. The quality of the effluent produced by a sewage treatment plant must be adequate to ensure that minimum standards set for receiving water body can be achieved.

The rationale for an expansion or upgrading project may, therefore, be based on the current or forecasted quality of effluent produced due to such problems:

- . inefficient operation of the treatment facility
- . inadequate original design of the system
- . original design criteria are no longer acceptable due to changes in quantity and quality characteristics of sewage being treated, e.g. due to infiltration or industrial waste discharge
- . industrial waste discharges contain chemicals toxic to the biological treatment process used in the treatment facility
- . changes in policies and guidelines for sewage treatment processes and for the receiving water body, i.e. existing disinfection practices no longer acceptable, existing phosphorous removal levels no longer acceptable
- . changes in the physical and chemical characteristics of the receiving water body due to upstream discharges
- . insufficient dilution of effluent by receiving water body, e.g. due to decreased flows in the river or stream

3. Problems Associated with System Capacity

The existing sewage system would not be capable of handling present or forecasted volumes of sewage due to such problems as:

- . system is at or approaching its original design capacity and cannot accommodate increased volumes of sewage
- . inadequate original design or construction of the system
- . deterioration in the condition of the system, e.g. increased roughness of sewers
- . infiltration of groundwater into the collection system, e.g. through cracked sewers
- . illegal connections into the collection system, e.g. roof drains, weeping tiles

- . changes in design philosophy, e.g. a reduction in acceptable settling tank overflow rates in the treatment facility

4. Problems Associated with Potential System Failure

Concern may be expressed as to potential system failure due to such factors as:

- . deterioration of system components due to age
- . structural failure of system components, e.g. pipe, tank
- . deterioration due to chemical attack, e.g. acid generation from septic sewage
- . repeated equipment breakdown
- . inadequate original design
- . inadequate construction of system

5. Problems Requiring Consideration of Design Improvements and New Technology

The system may be considered inefficient for reasons including:

- . increased cost of using existing equipment, e.g. maintenance and energy consumption
- . equipment does not meet performance specifications
- . inadequate design of system

6. Problems Associated with Management of Sludge Waste

The need for the project may result from problems such as:

- . the sanitary landfill site(s) at which sludge is currently being disposed of may be at or near capacity
- . the agricultural lands or "soil conditioning sites" at which sludge is utilized may be at or near capacity
- . the constituents of the sludge may make it unacceptable for disposal/utilization at existing available sites
- . Ministry policies or guidelines for sludge disposal/utilization may have changed

As noted, any one of these problems or any combination of problems could initiate the need for an expansion and/or upgrading project.

The identification of these needs is assisted by the ongoing review of capacity and operation of existing sewage systems under the Ministry's jurisdiction, as carried out by staff of the Ministry's six Regional Offices in the province.

I-6 PROJECTS NOT INCLUDED IN THIS CLASS

Project Co-ordination Branch interprets Regulation 836/76, Section 4(1) to mean that the Class Environmental Document *does not* apply to the following activities* associated with existing sewage systems:

- a. *Ongoing maintenance activities*, e.g. minor repairs to collection and/or treatment facilities and equipment overhaul, including *reconstruction* of the system to meet original requirements.
- b. *Normal activities of treatment facility operators with regard to treatment process efficiency*, e.g. adjustments to tank loadings or "wasting" of activated sludge, increasing or decreasing chemical dosage rates.
- c. *Normal activities of treatment facility operators with regard to equipment improvements* in order to improve facility operation and process efficiency, e.g. refitting of mechanical equipment, adjustments to equipment design, replacement of parts with improved design models.
- d. *Maintenance and/or minor improvements to the grounds and structures of treatment facilities*, e.g. landscaping, fencing, surfacing of access roads, painting and refacing buildings.

In addition, this Class Environmental Assessment does not apply to projects undertaken by the Ministry of the Environment which involve or require construction of:

- . a new sewage system
- . a new sewage treatment plant
- . a new lagoon treatment facility
- . a new sludge incinerator
- . a new landfill for sludge disposal

Projects which involve the above facilities are considered major undertakings and therefore are not appropriate for inclusion in this Class. Project Co-ordination Branch will prepare and submit an individual Environmental Assessment in each case where such projects are under its jurisdiction.

* *These activities listed are the responsibility of various agencies of the Ministry of the Environment other than Project Co-ordination Branch.*

I-7 ALTERNATIVES TO THE UNDERTAKINGS

In many instances, there may be more than one way of solving problems or meeting new demands on existing sewage systems. One type of solution which may be considered is an expansion or upgrading project. Solutions other than an expansion or upgrading which may also be considered are called, for the purposes of the document, "Alternatives to the Undertakings".

There are thirteen major alternative solutions which form the "Alternatives to the Undertakings" in this Class. They are:

1. Modify Operational Practices at the Treatment Facility
2. Expand Maintenance Program
3. Improve Individual Septic Systems
4. Reduce Sewage Flows
5. Reduce Industrial Discharge
6. Improve Community Stormwater Management
7. Alter Current Sludge Management Practices
8. Limit Community Growth
9. Discharge to an Adjacent Existing Sewage System
10. Construct a New Sewage System
11. Construct a New Sewage Treatment Plant
12. Construct a New Lagoon Treatment Facility
13. The "Do Nothing" Alternative

Depending on the nature of the existing sewage system and of the problems being encountered or forecasted, there are variations in the ways these thirteen general alternatives to the undertaking could be carried out. The most common of these variations are described in the following subsections.

In reviewing these subsections there are a number of factors the reader should keep in mind:

- a. A sewage system comprises a series of *interrelated components*. Therefore, many of the potential "Alternatives to the Undertakings" may resolve more than one of the six general problems previously described. For the reader's reference, the "Alternatives to the Undertakings" are related, in chart format, to the general problems they would normally be intended to solve.

- b. The *feasibility* of the "Alternatives to the Undertakings" will depend, in part, on the nature and location of the sewage system, the nature and location of the problem(s) and on the comparative cost of the alternative solutions.
- c. It is possible that the *only* feasible solution to the problem(s) may be an expansion and/or upgrading project in this Class. Conversely, there may also be *one or more* feasible "Alternatives to the Undertakings" which merit consideration in addition to the expansion or upgrading project.
- d. An Environmental Study Report (refer to Part III of this document) *will not be prepared* where the final recommended solution is one or a combination of the "Alternatives to the Undertakings". Such a recommendation would typically be made where it is evident that the costs of the particular expansion and/or upgrading project, both financial and environmental, significantly outweigh the benefits to be derived.
- e. Where the *final recommended solution* is an expansion or upgrading project in this Class, the "Alternatives to the Undertakings" will be documented in the Environmental Study Report prepared for the specific project.
- f. Project Co-ordination Branch does not have the responsibility or the mandate to carry out *all* of the "Alternatives to the Undertakings" listed in the following subsections. In various instances, the Branch may act only in an advisory capacity to municipalities or other government agencies, for example, with respect to alternatives aimed at 'reducing sewage flows'; 'reducing industrial discharge'; 'implementing community stormwater management'; 'limiting community growth'.

ALTERNATIVES TO THE UNDERTAKINGS

		General Problems					
		Public Health	Effluent Quality	System Capacity	Potential System Failure	Disposal/Utilization of Sludge	Design Improvements/ New Technology
1.	<u>Modify Operational Practices at the Treatment Facility</u>						
(a)	Limit operating hours of noisy equipment to reduce sound levels	.					
(b)	Reschedule the timing for or haulage routes of trucks removing sludge from the treatment facility to minimize traffic and safety problems in residential areas	.					
(c)	Alter quantities of sludge stored at the treatment facility and/or duration of sludge storage to minimize odour problems	.					
(d)	Alter timing of and/or duration at land treatment areas (e.g. spray irrigation at lagoon treatment facilities in order to minimize "aerosol" effects on adjacent uses)	.					
(e)	Ensure that the operator of the treatment facility is following proper procedures to optimize operational efficiency and adherence to required effluent standards	.	.				
(f)	Modify operational procedures at the existing treatment facility by adjustments to tank loadings, chemical additions, etc.	.	.	.			
(g)	Undertake training programs to upgrade operators' understanding of treatment procedures and Ministry policies, guidelines and practices	.	.	.	.		
2.	<u>Expand Maintenance Program</u>						
(a)	General cleaning of the sewage system to improve treatment efficiency	.					
(b)	General cleaning of the sewage system to improve hydraulic characteristics	.		.			
(c)	Undertake normal maintenance activities such as equipment overhaul, replacement of parts, repair of damaged tankage	.		.	.		
3.	<u>Improve Individual Septic Systems</u>						
(a)	Repair existing septic tanks and/or tile fields	.		.			
(b)	Enlarge existing septic tanks and/or extend tile fields	.		.			
4.	<u>Reduce Sewage Flows</u>						
(a)	Enforce municipal by-laws with respect to permitted connections to the sewage collection system, e.g., sever illegal roof drains and weeping tiles	.	.				
(b)	Undertake normal maintenance of the collection system to minimize groundwater infiltration into the sewers	.		.			
(c)	Instigate a community water conservation program in order to reduce overall sewage discharge volumes	.		.			
(d)	Recommend that proposed development in the community be serviced by individual/communal subsurface disposal systems in order to minimize additional sewage load	.	.				

ALTERNATIVES TO THE UNDERTAKINGS

		General Problems					
		Public Health	Effluent Quality	System Capacity	Potential System Failure	Disposal/Utilisation of Sludge	Design Improvements/ New Technology
5.	<u>Reduce Industrial Discharge</u>						
(a)	Enforce existing municipal Industrial Waste By-law (i.e., by-law sets criteria for quality of industrial sewage discharge)	.	.	.	.	.	.
(b)	Instigate adoption of Industrial Waste By-law in municipality	.	.	.	.	.	.
(c)	Instigate amendment to Industrial Waste By-law in order to require pretreatment of sewage at industrial plants	.	.	.	.	.	.
(d)	Instigate amendment to Industrial Waste By-law in order to require "in-house" process changes in industrial plants	.	.	.	.	.	.
6.	<u>Improve Community Stormwater Management</u>						
(a)	Provide or expand temporary or permanent runoff storage facilities to accommodate "wet weather" peak runoff flows, e.g., in ponds, swales, fields, parking lots, roof tops, parks	.	.	.	.	.	.
(b)	Install inlet controls, as part of normal maintenance activities, to prevent surcharge of combined sewers during "wet weather" peak runoff periods	.	.	.	.	.	.
(c)	Instigate improved street maintenance program (i.e., cleaning, removal and disposal of debris) to minimize grit and solids entering sanitary sewers where combined or inter-connected with storm sewer system.	.	.	.	.	.	.
(d)	Recommend that municipal/provincial approval for new developments require the incorporation of urban runoff control measures, e.g., on-site stormwater retention, minimization of impervious areas, appropriate lot grading, discharge of roof drains onto grassed areas to maximize absorption through ground, etc.	.	.	.	.	.	.
(e)	Recommend that municipal/provincial approvals for major phased development be based on a comprehensive master drainage plan and a comprehensive pollution control strategy for the community, with appropriate policies to be included in the municipal Official Plan	.	.	.	.	.	.

NOTE: Such "alternatives to the undertakings" as listed above may resolve problems which have developed as a result of combined sewers (storm and sanitary) overflows, bypass of sewage (i.e., into storm sewers) or bypass of sewage (directly into the receiving water body) at treatment facility. These situations typically occur during "wet weather" periods of peak runoff.							
7.	<u>Alter Current Sludge Management Practices</u>						
(a)	Utilize alternative chemicals or quantities of chemicals and/or chemicals and/or chemical dosing methods to reduce heavy metal characteristics in sludge thereby making it acceptable for disposal/ utilization	.	.	.	.	.	.
(b)	Undertake normal maintenance of or minor improvements to sludge dewatering equipment to increase process efficiency and reduce sludge volume	.	.	.	.	.	.
(c)	Increase or decrease the application rate of sludge disposal at existing landfill site(s)	.	.	.	.	.	.

ALTERNATIVES TO THE UNDERTAKINGS

7. Alter Current Sludge Management Practices (cont'd)
 - (d) Increase or decrease the application rate of sludge utilized on existing agricultural land
 - (e) Increase or decrease the quantity of sludge stored on a contingency basis in existing facilities at the treatment plant or transfer stations, in order to resolve scheduling problems at disposal or utilization sites
 - (f) Construct a new sludge incinerator to complement/substitute for existing disposal/utilization methods
 - (g) Improve the operating efficiency of an existing sludge incinerator
8. Limit Community Growth
 - (a) Recommend that the municipality limit the ultimate extent and/or location of proposed residential industrial and commercial growth in the community
 - (b) Recommend that the municipality strictly phase or schedule proposed growth in the community, potentially with respect to both location and implementation timing
9. Discharge to an Adjacent Sewage System
 - (a) Discharge sewage from part of the community presently serviced into an existing sewage system located in an adjacent municipality or community
 - (b) Discharge sewage from proposed development areas into an existing sewage system located in an adjacent municipality or community
10. Construct a New Sewage System
 - (a) Construct a new sewage system to service proposed development areas
11. Construct a New Sewage Treatment Plant
 - (a) Construct a new sewage treatment plant within an existing collection and treatment system to replace or supplement an existing sewage treatment plant or lagoon treatment facility
12. Construct a New Lagoon Treatment Facility
 - (a) Construct a new lagoon treatment facility to supplement or replace an existing communal and/or individual subsurface disposal systems

General Problems					
Public Health	Effluent Quality	System Capacity	Potential System Failure	Disposal/Utilization of Sludge	Design Improvements/ New Technology
				.	
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ALTERNATIVES TO THE UNDERTAKINGS

13. The "Do Nothing" Alternative

In the "Do Nothing" alternative, no improvements or changes would be made to solve the identified problem(s). This means that the problems would remain in the system. It does not necessarily mean, however, that no further development in the community would occur. The Ministry of the Environment has the responsibility of making recommendations on proposed developments but it is the Ministry of Housing (or the Regional Municipality) which grants the ultimate approvals.

Where an expansion or upgrading project in this Class is one of the alternative solutions considered, and is the recommended solution, the "Do Nothing" alternative will also be investigated. The "Do Nothing" alternative will be documented in the Environmental Study Report along with any other alternatives to the undertaking which were examined.

The "Do Nothing" alternative may be actually implemented at any time during the Design Process prior to the commencement of construction. A decision to "Do Nothing" would typically be made when the costs of all other alternatives, both financial and environmental, significantly outweigh the benefits.

General Problems	
Public Health	.
Effluent Quality	.
System Capacity	.
Potential System Failure	.
Disposal/Utilization of Sludge	.
Design Improvements/ New Technology	.

I-8 ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKINGS

This section describes *the various ways* that could be considered for carrying out a specific expansion or upgrading project. For the purposes of this document these are referred to as the "Alternative Methods of Carrying Out the Undertakings". These differ from the "Alternatives to the Undertakings" in that the latter refer to *options which might be recommended instead of* an expansion or upgrading project in this Class.

For a specific expansion or upgrading project, the "Alternative Methods of Carrying Out the Undertaking" may comprise both alternative *design solutions* and alternative *construction solutions*.

In the following subsections, the typical alternative *design solutions* are grouped by the sewage system facility for which they would normally be considered. These facilities are:

1. Gravity Sewers, Vacuum Lines, Low Pressure Lines
2. Pumping Stations
3. Communal Subsurface Disposal Facilities
4. Primary/Secondary/Tertiary Treatment Facilities
5. Lagoon Treatment Facilities
6. Sludge Management System

A seventh subsection discusses how alternative *construction solutions* will be dealt with for projects in this Class.

In reviewing the seven subsections, there are a number of factors which the reader should keep in mind:

- a. A sewage system, as previously emphasized, comprises a series of *interrelated components*. As a result, the "Alternative Methods of Carrying Out the Undertakings" may resolve more than one of the six general problems. For the reader's reference, the "Alternative Methods of Carrying Out the Undertakings" are related, in chart format, to the general problems they would normally be intended to solve.

For example, major repairs undertaken to minimize infiltration into gravity sewers may alleviate loading problems experienced at the lagoon treatment facility serving the community. As a result, the planned expansion of the lagoon system (to service proposed development) may be designed for a lesser ultimate capacity than was originally envisaged on the basis of existing and projected future sewage loading.

- b. The *feasibility* of the various "Alternative Methods of Carrying Out the Undertakings" will depend, in part, on the nature and location of the sewage system, the nature and location of the identified problem(s) and the comparative cost of the Design Alternatives.
- c. It is possible that, for the particular identified problem(s), *only one or conversely several* of the potential "Alternative Methods of Carrying Out the Undertakings" will be feasible.
- d. The "Alternative Methods of Carrying Out the Undertakings" which are considered for a *particular* expansion or upgrading project will be documented in the Environmental Assessment Report for that project.
- e. The "Alternative Methods of Carrying Out the Undertakings" listed in the following subsections represent the most common design solutions which would be considered for an expansion or upgrading project in this Class. These lists should not, however, be misconstrued as all-inclusive.

ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKINGS
ALTERNATIVE DESIGN SOLUTIONS

		General Problems				
		Public Health	Effluent Quality	System Capacity	Potential System Failure	Disposal/Utilization of Sludge Design Improvements/ New Technology
1.	<u>Expand and/or Upgrade Gravity Sewers, Vacuum Lines, Low Pressure Lines</u>					
(a)	Extend the sewers to service new development			.		
(b)	Replace the existing sewers with a larger size			.		
(c)	Provide relief sewers			.		
(d)	Add tankage along with the collection system to provide in-line interim storage to even out sewage loads discharged to treatment facility			.		
(e)	Undertake major repairs of damaged sewers and manholes, e.g., to minimize infiltration problems			.	.	
(f)	Provide sewers with a liner to minimize chemical attack problems				.	
(g)	Reline existing sewers to reduce infiltration problems			.		
2.	<u>Expand and/or Upgrade Pumping Stations</u>					
(a)	Install additional pumps			.		
(b)	Replace existing pumps with improved design/new technology			.		
(c)	Provide pilot pump and/or variable speed pumps to alter loading characteristics and improve efficiency/capacity			.		.
(d)	Provide additional or improved screening (to break down clots in sewage)			.		
(e)	Duplicate existing forcemain			.		
(f)	Reroute sewers to eliminate need for a pumping station			.		
(g)	Undertake measures to reduce septicity in the wet well, such as the addition of aeration, oxygen injection or disinfection equipment; reduction in size/division of the wet well		.			
(h)	Provide for chemical addition equipment. This equipment would complement and/or reduce the need for subsequent chemical addition at the treatment facility		.			
(i)	Undertake major repairs to pumping station and forcemains			.	.	
(j)	Provide for standby diesel generator as alternative power source to prevent sewage overflow and backing up in gravity sewers during power outages		.		.	
3.	<u>Upgrade and/or Expand Communal Subsurface Disposal Facilities</u>					
(a)	Increase size of communal septic tanks or tile fields			.		
(b)	Replace septic systems with aerobic package plant(s)			.		
(c)	Undertake extensive repairs to meet the design and operation criteria of Ontario Regulation 229			.	.	

ALTERNATIVE DESIGN SOLUTIONS

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ALTERNATIVE DESIGN SOLUTIONS

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7. Alternative Construction Solutions

Various construction activities typically involved in expansion or upgrading projects in this Class have potential for adverse environmental impact. As part of the Design Process for projects in this Class, therefore, *various feasible construction methods* will be examined with the objective being to minimize such potential impacts. The construction alternatives considered will be documented in the Environmental Study Report.

The feasible construction alternatives which may be considered for a particular expansion or upgrading project in this Class will depend, in part, on the nature and locating of the sewage system, the nature and location of the proposed expansion or upgrading work(s), and on the comparative cost of the alternative construction methods. It is, of course, possible that only one feasible construction method may be identified while, conversely, a wide range of options may require consideration in order to select those that minimize adverse impacts.

An expansion or upgrading project in this Class will be carried out under contract let by competitive tender. The selected contractor is normally, but not necessarily, the lowest bidder.

Where adverse environmental impacts resulting from construction activities have been identified during the Design Process, the requirement for *special provisions* will be identified in the Environmental Study Report and they will also be written into the project construction specifications. These provisions will, to the extent necessary, indicate such restrictions as the mode of operation allowed, timing, sequence, duration, and remedial work required.

Appendix II contains the "Environmental Considerations for the Planning and Construction of Provincial Sewer and Water Projects" as an illustration of the type of guidelines followed in identifying *special provisions*. An excerpt from the construction specifications for the York-Durham Sewage System illustrates the manner in which these guidelines are translated into detailed specifications in the contract documents.

Where an adverse impact occurs during construction and was not identified previously, the problem will have to be dealt with on-site under the direction of the construction supervision personnel. If this impact is considered significant, either by the proponent or the monitoring agency, *an Addendum to the Environmental Study Report* will be written (refer to Part III-3, "Revisions and Addenda").

The contractor implementing an expansion or upgrading project in this Class is subject to *construction supervision* from commencement of the work until all work is completed to the satisfaction of Project Co-ordination Branch. The construction supervisor's role is to ensure that the contractor meets the contract design requirements and complies with all specifications, special provisions and pertinent legislation. Lack of compliance by the contractor may result in the contractor being required to undertake remedial or additional work at his own cost, forfeiture of posted bond money and, potentially, prosecution for breach of contract.

Contractors differ in sequence of operations, construction techniques, methods of operation, speed of operation and the type, make and size of equipment used. There is, however, a fairly general uniformity in construction operations as a result of the pressures of intense competition in the industry.

I-9 PROVISION FOR REQUIRING AN INDIVIDUAL ENVIRONMENTAL ASSESSMENT
FOR A PROJECT IN THIS CLASS

If it is found that a project in this Class has associated with it severe environmental condition changes, it may be appropriate to carry out an individual Environment Assessment.

The circumstances which would lead to such a decision are not considered to be necessarily related to such factors as the cost or size of a project in this Class. For example, such a decision may be required when:

- a. The history of the problem(s) associated with the existing sewage system suggests that potential environmental impacts are extensive, environmental features are very sensitive or that the social or financial implications of solving the problem(s) are controversial.
- b. Preliminary work on or public reaction to a proposed expansion and/or upgrading project suggests that potential environmental impacts are more significant, environmental features are more sensitive or the social and financial implications more controversial than originally assumed.
- c. The remedial measures proposed to mitigate adverse environmental condition changes are not considered appropriate, adequate or extensive enough to resolve concerns expressed.

The mechanism for requiring an individual Environmental Assessment to be carried out for a project in this Class will be one of the following:

1. Project Co-ordination Branch, as advised by the Regional Director, would notify Environmental Assessment Section, Environmental Approvals Branch of its intent to carry out an individual Environmental Assessment for a project in this Class.

Generally this decision would be based on recognition early in the design process of sensitivities associated with the project. However, any individual, public group, or government agency may bring its concerns to the attention of the Director, Project Co-ordination Branch at any time from inception of the design process until 30 days after submission of the Environmental Study Report and request that an individual Environmental Assessment be prepared.

2. The Minister of the Environment may direct Project Co-ordination Branch to prepare an individual environmental assessment. In this regard, any individual, public group or government agency may bring its concerns to the attention of the Minister at any time from inception of the design process until 30 days after submission of the Environmental Study Report and request that an individual Environmental Assessment be prepared.

PART II - DESIGN PROCESS

II-1 INTRODUCTION

This part of the document explains how Project Co-ordination Branch will ensure that the requirements of The Environmental Assessment Act are fulfilled in the design and construction of projects in this Class.

1. Contents of Part II

There are three stages in the design process - Project Initiation, Preliminary Design and Final Design. Sections II-2, II-3 and II-4 identify the technical activities and the decision-making process involved in these three stages. Also, the involvement of the public, other government agencies and the Environmental Assessment Section* of Environmental Approvals Branch in these activities is described. The process of implementation or construction is discussed in Section II-5. A flow chart of the design process is provided in Figure 1.

2. Administration of the Design Process

Before reviewing the descriptions of the three design process stages, it is useful for the reader to understand the Ministry's administrative framework for projects in this Class. While Project Co-ordination Branch is responsible for the actual design and construction of such projects, the Ministry's Regional Offices are involved in the determination of need for improvements to existing sewage systems. They also advise the Branch and review projects throughout the design process. The Environmental Approvals Branch is responsible for approving the design for a project developed by Project Co-ordination Branch. Other Ministry Branches are involved in the design process, providing advice on various design considerations.

Within Project Co-ordination Branch, a Project Manager on staff with the Co-ordination Section, is responsible for all potential projects in a specific region of the province. The Project Manager co-ordinates the overall design process and supervises the consulting engineering firm retained to carry out technical investigations in the Preliminary Design and Final Design stages. The Design and Equipment Selection Section of the Branch is responsible for reviewing and approving the technical/engineering aspects of the consultant's design work and advises the Project Manager throughout the design process. Other sections of the Branch provide input to the Project Manager as required (e.g. Realty Services involved in site and property negotiations).

* This is the Ministry of the Environment agency responsible for administration of The Environmental Assessment Act, 1975.

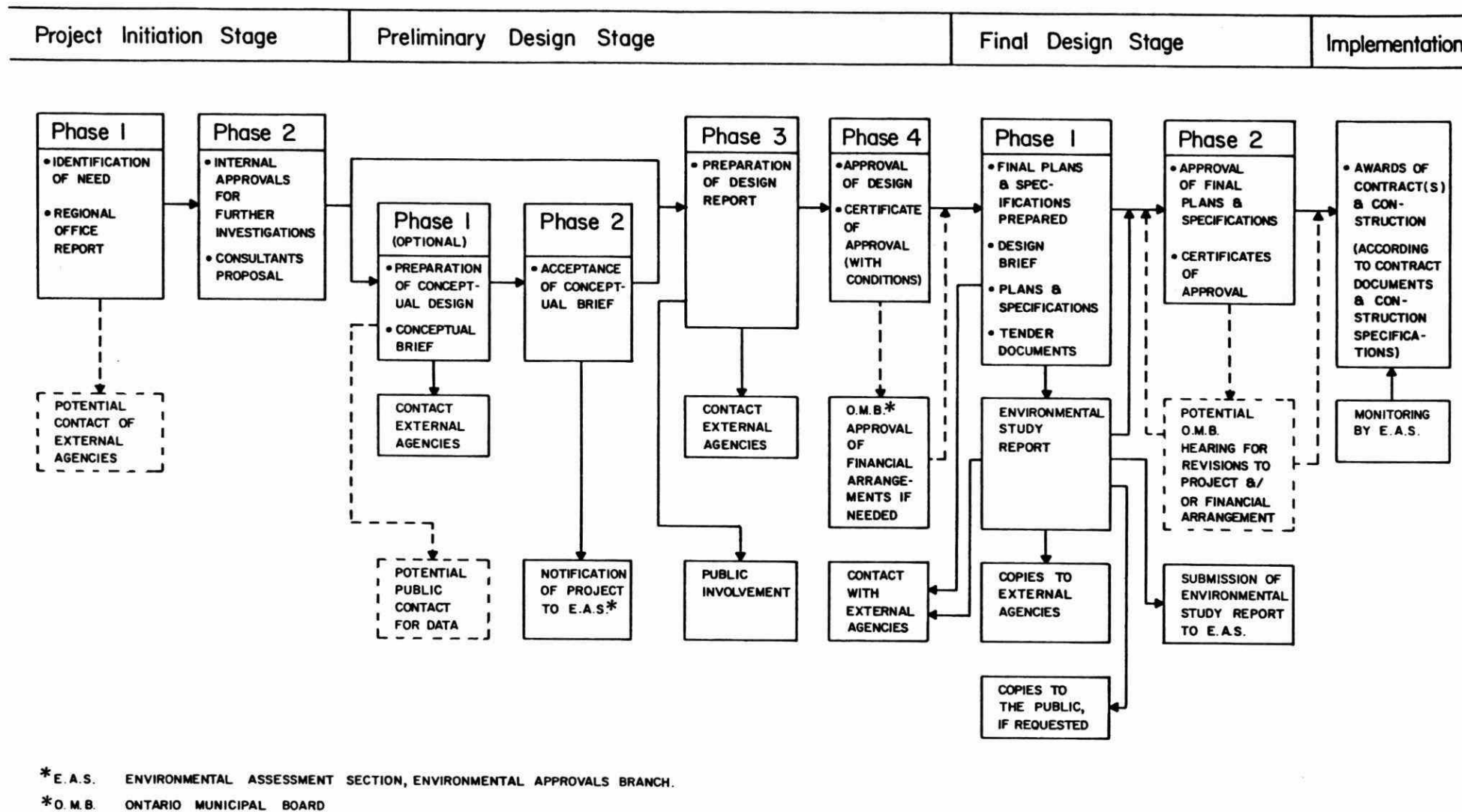


Figure 1
THE DESIGN PROCESS

II-2 PROJECT INITIATION STAGE

This first stage of the planning and design process begins with the identification of the problems to be solved or needs to be met and concludes with the selection of a consultant to carry out the necessary studies. This stage consists of two phases:

- . Phase One - Identification of Need
- . Phase Two - Internal Approvals for Further Investigations

These two phases and the documents pertaining to these phases are illustrated in Figure 1 and explained below.

Phase One: Identification of Need

This initial phase typically consists of the following four sequential steps:

Step 1. Initial Identification of Problem(s)

The Regional Office of the Ministry of the Environment informs Project Co-ordination Branch of the problem(s) occurring in the existing sewage system,

or

The municipality forwards a request and/or Council resolution to Project Co-ordination Branch with respect to the problem(s).

Step 2. Region Prepares Report on Problem(s) and Need

At the request of Project Co-ordination Branch, the Regional Office prepares a report or memorandum outlining the nature of the problem(s) and the need for improvements to the sewage system. The report also includes terms of reference for the design report investigations. Project Co-ordination Branch informs the municipality that this report is being prepared.

Step 3. Branch Evaluates Need

Project Co-ordination Branch reviews the Regional Office report and evaluates the need for improvements using the Ministry's "MBR" (Management by Results) rating system. In this system, scores are assigned for such objectives as:

- . the removal of health hazards
- . environmental protection
- . accommodation of planned development in the municipality
- . community enhancement

The MBR rating system is used to determine whether or not to proceed with further investigations (i.e., a minimum total score must be achieved) and to assign priorities for various investigations for improved sewage service.

Step 4. Municipal Agreement for Further Investigations

Project Co-ordination Branch writes to the municipality confirming the need for improvements to the sewage system as outlined in the Regional Office report. The municipal Council is requested to pass an appropriate resolution (if this has not already been done in Step 1 above) requesting the Ministry to proceed with further investigations. The Council resolution will contain appropriate wording to indicate agreement to accept all external costs incurred by the Ministry if the project does not proceed to implementation.

Step 5. Internal Memorandum on Sewage Treatment Alternatives (where applicable)

As a final step in this phase, the Design and Equipment Section of Project Co-ordination Branch prepares an internal memorandum indicating the alternative types of sewage treatment which should be considered (where this is appropriate with respect to the identified problem(s)). The recommendations given in this memorandum are based on a review of the Regional Office report, accepted engineering practices, Ministry policies and guidelines, and the judgement and experience of the Branch personnel involved.

Phase Two: Internal Approvals for Further Investigations

This phase typically comprises four sequential steps, as outlined below:

Step 6. Internal Request for Approvals

Project Co-ordination Branch submits a request for approval of further investigations (with the objective of improving the existing sewage system in the municipality) to the Assistant Deputy Minister, Environmental Assessment and Planning Division, Ministry of the Environment. This request also contains a recommendation on the consulting engineer(s) to be engaged to carry out the investigations. The recommendations of consultant(s) is based on a discussion held, with respect to the project, by the Consulting Engineer Selection Committee, comprising representatives of Project Co-ordination Branch and Environmental Approvals Branch of the Ministry of the Environment.

Step 7. Consultant Prepares Proposal

The recommended consultant, on the request of Project Co-ordination Branch, prepares a proposal which includes discussions of the estimated cost of the preliminary design work, approach to the studies, personnel to be assigned, timetable and, potentially, recommendations on soil testing or other investigations. The contents of the proposal

are based on the terms of reference provided by Project Co-ordination Branch and the judgement, knowledge and experience of the consultant. The consultant will be provided with a copy of the approved Class Environmental Assessment document for use in preparing the proposal.

Step 8. Consultant Authorized to Proceed

The consultant's proposal is reviewed by Project Co-ordination Branch. A meeting may be held with the consultant to further discuss the terms of reference, the proposal and such matters as specific engineering or other investigations to be undertaken. The consultant is provided with copies of any relevant Ministry of the Environment guidelines.

Project Co-ordination Branch authorizes the consultant to proceed when the proposal is considered satisfactory and the Assistant Deputy Minister's approval for the investigations has been obtained. An agreement covering the preparation of the Design Report is signed by the consultant and executed by the Minister of the Environment.

II-3 PRELIMINARY DESIGN STAGE

This stage involves the preparation of a "Conceptual Brief" (if needed) and a Design Report in which the consultant investigates and evaluates "Alternatives to the Undertaking" and "Alternative Methods of Carrying Out the Undertaking" and recommends a preferred alternative for the final design.

The extent to which a rigorous investigation and evaluation of alternatives is carried out depends on the complexity of the problem under consideration. In many cases the problem is simple, the number of available solutions is small and the evaluation is obviously simple, and straightforward.

Where more complex problems are under investigation and numerous alternative solutions are available, the evaluation process is more complex. In such cases, the Preliminary Design stage may include a preliminary investigation and evaluation of *Conceptual* alternative, the results of which are presented in the form of a "Conceptual Brief". However, for most problems which are simple, no formal "Conceptual Brief" is prepared as part of the preliminary design work.

The "Preliminary Design Stage" may therefore consist of two to four phases as described below and in Figure 1:

- . Phase One - Conceptual Design (Optional)
- . Phase Two - Acceptance of Conceptual Brief

- . Phase Three - Preliminary Design Report
- . Phase Four - Approval of Design

Phase One: Conceptual Design (Optional)

Where the Design and Equipment Section of Project Co-ordination Branch determined (in Step 5) that the problem was sufficiently complex to require the investigation of numerous alternative solutions, Project Co-ordination Branch would instruct the consultant to include in his proposal (Step 7) provision for a "Conceptual Brief".

Step 9. Preparation of Conceptual Brief

The purpose of the Conceptual Brief is to identify and evaluate alternative *conceptual* design solutions to the problem(s) identified in the existing sewage system. The alternative solutions considered in a conceptual form will include:

- . *Any feasible expansion or upgrading project in this Class* (refer to Part I-3, "Description of the Undertakings in this Class")
- and*
- . *Any feasible "Alternatives to the Undertaking", that is, potential solutions other than an expansion or upgrading project in this Class* (refer to Part I-6, "Alternatives to the Undertakings").

The extent to which the alternative solutions are detailed will depend on the nature and location of the existing sewage system and the nature and location of the problem(s). The evaluation of alternatives is not a formal process but is primarily an elimination process in which alternatives are being evaluated in greater detail until one or more are selected for design work as outlined in Phase Three. Potential alternatives are examined only until there is sufficient justification for their rejection.

In investigating the alternative solutions, the consultant will assemble and review existing information such as:

- . The Regional Office report (discussed in Step 2 above)
- . Current and historical information available with respect to existing sewage loads at the treatment facility, raw influent/effluent quality, operational problems, system design parameters, condition of the collection, treatment and sludge management facilities
- . Current and historical information available with respect to planned development in the community, adjacent land uses, water quality criteria for the receiving water body, physical, natural and socio-economic conditions of the study area

Results of such preliminary on-site observations or investigations as are considered necessary by the consultant and Project Co-ordination Branch

The consultant will identify external agencies (both governmental and non-governmental) who should be contacted to determine if any of the feasible alternatives could significantly affect any program or area of responsibility of these agencies. The consultant will advise these agencies of the nature of the problem(s) or need, the alternatives under consideration, and will request a statement of concerns and any available data about the environment in the area(s) under investigation.

The evaluation and selection process is based upon accepted engineering practices and the judgement, training and experience of the personnel responsible for this step. The analysis of alternatives is based on engineering, social, environmental and financial factors. If the specialized expertise of an external agency is required in the interpretation and evaluation of data, further consultation with the relevant agency will occur.

The Conceptual Brief will indicate the extent to which each alternative solution will resolve the identified problem(s). It will provide a comparison, based on the available information, of the possible benefits and adverse environmental impacts of the various solutions. In addition, it will include a comparison of the *probable magnitude* of costs of the alternative solutions. One or more alternatives will be recommended for further study.

Phase Two: Acceptance of Conceptual Brief

Step 10. Internal Acceptance of Conceptual Brief

Once a Conceptual Brief is prepared, the consultant submits it to Project Co-ordination Branch for review. Project Co-ordination Branch distributes copies to various personnel and sections within the branch, to the Regional Office and to such other parties as are appropriate (e.g., municipality, other Ministry of the Environment branches, other provincial agencies). Each party forwards its comments on the Conceptual Brief to each other party. Where a Regional Municipality is involved, the Regional Office consults with appropriate staff, as necessary, in preparing its comments but the Regional Municipality is not directly a member of the review group. Project Co-ordination Branch may hold a meeting to resolve any conflicting comments before compiling the comments.

Project Co-ordination Branch then compiles the comments and forwards these to the consultant, with copies circulated to the Regional Office and various Branch staff. A meeting may be arranged between the consultant and personnel of the Branch and of the Regional Office. If additional information or a revised *Conceptual* Brief is required, this information will be circulated for comment, as outlined in the preceding paragraph.

After technical approval of the Conceptual Brief has been received from the Design and Equipment Section of Project Co-ordination Branch, the consultant is informed of this approval and given directions as to what the next step in the Design Process will be.

Phase Three: Preliminary Design Report

The purpose of the Design Report is to investigate design alternative(s) in sufficient detail to allow for their evaluation with respect to costs, the extent to which they resolve the problem(s), and their technical feasibility in terms of accepted engineering practices and the potential environmental consequences of their implementation.

In the case where a Conceptual Brief has been prepared, the alternative solution(s) under consideration would normally comprise the "Alternative Methods of Carrying Out the Undertaking". In most instances the alternative solutions will consist of "design alternatives" and "construction alternatives" related to a specific expansion or upgrading project in this Class. However, further examination of one or more "Alternatives to the Undertaking" may be necessary as well.

Where no Conceptual Brief has been prepared, both types of alternatives would be considered. The process of evaluating alternative solutions is identical to that described in Step 9.

Step 11. Investigate Conditions in the Study Area

The consultant will collect and examine all necessary information on existing conditions in the study area.

Relevant technical engineering data will be received, including such information as:

- . soil data, e.g., depth of overburden, soil structural properties
- . topography, e.g., slope and floodplain mapping
- . sewage flow records
- . influent/effluent quality records
- . well log data, e.g., well locations, water table levels, groundwater quality, soil materials
- . water quality and flow records for receiving water body
- . data on water usage, e.g., upstream, downstream treatment facilities, recreational use
- . location, size, operational characteristics of adjacent individual/communal subsurface disposal systems, where applicable
- . data on specifics of operational/treatment problems occurring at the treatment facility, where applicable
- . maintenance activity records

In this step, the consultant will also undertake an appraisal of pertinent physical, natural and socio-economic factors which may affect or be affected by the alternative solution(s). The information collected and examined may include various parameters of the following factors:

- | | |
|----------------------------|--|
| . soils | . aquatic life |
| . surface drainage | . aesthetics |
| . subsurface drainage | . noise |
| . topography and landforms | . existing land uses |
| . air quality | . proposed land uses |
| . water quality | . community disruption |
| . climatic features | . environmental health |
| . vegetation | . heritage resources |
| . wildlife | . economic and financial capability of community |

The specific factors which are investigated (and the extent of detail obtained) will depend, in part, on the nature and location of the existing sewage system. The environmental characteristics for existing sewage systems in Ontario are obviously as diverse as are the variations found in geology, surficial soils, ecosystems, local biological communities and patterns of land use in rural areas, hamlets, villages, towns and cities. There are, however, some general typical locational characteristics for various sewage system facilities which may be of interest to the reader. These are described in Figure 2.

Step 12. Develop Alternative Design Solutions

In this step, the consultant will develop the recommended conceptual design solution(s) in greater detail, e.g., technical, location, cost.

It is important to note again that this may involve further examination of one or more "Alternatives to the Undertaking" *in addition to* the "design alternatives" feasible for the particular expansion or upgrading project in this Class. The engineering and environmental data collected during the preceding step will be used in the development of the "design alternatives" and, where applicable, the "Alternatives to the Undertaking".

The environmental data will just be applied in identifying any "condition changes" that may be associated with the alternative solutions. Appendix III illustrates the broad range of changes which *may* be associated with expansion or upgrading projects. A significant number of

FIGURE 2

TYPICAL LOCATIONAL FACTORS FOR
SEWAGE SYSTEM FACILITIES

Sewage Collection Component

Gravity sewers are the norm in most sewage systems in the province.

Vacuum lines (sewers) are typically utilized in smaller communities having minimal topography and/or a high water table, thus making the use of gravity sewers too costly or technically unfeasible.

Low pressure lines (sewers) are typically utilized in smaller communities characterized by excessive topography and/or bedrock close to the surface, thus resulting in prohibitive construction costs for gravity sewers due to the extensive excavation required.

Pumping stations are usually located at low topographical elevation points along the sewer system.

Sewage Treatment Component

Individual Sursurface Disposal Facilities are normally used to service individual residences on large lots in rural or urban fringe locations. In small communities, often in northern or eastern Ontario, built-up urban areas including commercial as well as residential uses may be serviced in this manner, particularly in older portions of the community. Throughout the province, many residential areas that were once "pockets of development" close to urban areas are still serviced in this way, although the community has expanded outward to incorporate the respective area.

Communal Subsurface Disposal Facilities are normally found in hamlets or small villages or in suburban or urban fringe estate-type developments.

Primary Treatment Facilities are limited to certain areas along the Upper Great Lakes, their inter-connecting channels, the St. Lawrence River and the Ottawa River, where adequate dilution capacity is available with no potential significant impairment to downstream water quality.

Lagoon Treatment Facilities require large land areas for the lagoon itself and for any land treatment processes as may be used. Typically, a lagoon services smaller communities and is located in a rural area. Such facilities are not normally feasible in densely populated areas due to land costs and potential conflicts with adjacent land uses.

Secondary Treatment Facilities are required in addition to Primary Treatment in all areas in Ontario where the treatment plant would discharge effluent to any receiving water body other than along certain portions of the Upper Great Lakes, their interconnecting channels, the St. Lawrence River and the Ottawa River.

Tertiary Treatment Facilities are typically added to sewage systems where the receiving water body is very sensitive to effluent quality for various reasons.

An *Outfall* typically comprises one or several submerged pipes which discharge effluent from the Treatment Facility directly into the receiving water body.

Sludge Management Component

Sludge dewatering equipment is a normal component of the Primary/Secondary/Tertiary Treatment Facility.

Sludge disposal may be accomplished through disposal of dewatered sludge at sanitary landfill sites. Alternatively, the sludge may be incinerated at the Treatment Facility site or at a central location serving several treatment facilities.

Sludge utilization may be accomplished on agricultural lands, or by composting the dewatered sludge at the Treatment Facility site or at a central location serving several treatment facilities.

these changes will not necessarily be associated with a specific project in a specific location. This Appendix is *not* a rigorous 'checklist' by which the quality of environmental assessment on a specific project may be measured. The purpose of the Appendix is simply to illustrate the types of environmental condition changes which may or may not require further investigation in greater depth for a particular design.

For each of the potential condition changes which are identified, the area of potential impact will be determined. For example, if the change relates to potential disruption of a 'sensitive stream' from construction of a sewer along the valley and across the stream, the aquatic habitat, water quality, and soils material in the "impact area" would be examined, by using the information already obtained or obtaining additional information as required.

The next activity would be to evaluate potential for minimizing or avoiding potential impacts by:

- . modifying the actual "design alternatives" for the expansion or upgrading project
- . selecting appropriate "construction alternatives" and related mitigative measures for unavoidable impacts

This will require an understanding of the sensitivity of the impact areas as gained through an examination of the potential 'impact type', 'duration', 'reversibility' and 'significance' for each impact area (refer to Appendix IV for discussion of these terms).

The results of the above appraisals will be taken into account in the ongoing development of the alternative solutions which is occurring in this phase. The consultant will assess the extent to which the alternative solutions represent or can accommodate features to minimize any adverse environmental impacts. Where necessary, external agencies will be contacted for specialized assistance. Where possible and appropriate the consultant will also develop preliminary cost estimates for mitigating the unavoidable adverse impacts associated with each alternative solution.

The following examples illustrate how environmental condition changes may influence the "*design*" and/or "*construction*" component of alternative solutions for an expansion and/or upgrading project:

- . *To minimize disruption of adjacent uses*, features may be incorporated into the design of a treatment facility in order to minimize noise and odour; the buffer zone may be expanded beyond the minimum requirement; architectural form for the structures and landscaping amenities may be altered to ensure compatibility.
- . *To minimize disruption of a wooded area* through which a sewer must be constructed, the alignment may be adjusted

to conform with recommendations of a detailed vegetation sensitivity study; the woodlot may be 'pre-stressed' by selective cutting; and detailed protection and remedial measures developed for construction.

- . *To minimize property requirements* and therefore impacts on adjacent agricultural uses, the design for a treatment facility expansion may be altered by modifying the on-site layout of facilities or the arrangement of treatment components, e.g., 'stacking' of tanks.

Step 13. Evaluate Alternative Design Solutions and Make Recommendations

There is no formalized process for evaluating a specific design solution or set of alternative design solutions. The evaluation procedures used are based on the judgement, knowledge and experience of the responsible consultant and input from external agencies.

In the evaluation, the consultant will assess the costs, benefits and environmental implication of the alternative solutions, taking into consideration such factors as:

- . effectiveness of the design(s) in resolving the identified problems
- . achievement of system design criteria, water quality objectives
- . accommodation of planned community growth
- . potential environmental impacts and potential for mitigation of any impacts
- . property requirements
- . overall cost of the design(s)

A recommendation will be made as to the most acceptable design or design(s) which should be examined further in the next Stage - Final Design. This recommendation will be made based on the judgement, knowledge and experience of the consultant with respect to the evaluation undertaken and on accepted engineering practices.

The consultant will circulate copies of a draft "*Design Report*" to other agencies for comment. Requests for public comment (Sec. II-7) would occur at this time (Sec. II-6). Based on the work undertaken to this point and many changes necessitated by the external comments, the consultant would submit a final "*Design Report*" to Project Co-ordination Branch. The report will describe the design solution or alternative solutions considered and the evaluation process which resulted in the given recommendations. It will indicate, to the extent appropriate for a particular project the respective technical design criteria, technical construction requirements, property requirements and costs. The extent of detail provided will, of course, vary depending on the complexity of the

design(s) and the amount of further work required in the next Stage.

In addition, the Design Report will identify those potential adverse environmental impacts requiring further investigation in the next Stage and also those identified remedial measures to be detailed for either further potential design modification or for incorporation into the construction specifications.

Phase Four: Approval of Design(s)

This phase involves the various Ministry and other approvals necessary for the project to proceed to the next Stage - Final Design. This phase typically comprises the following steps:

Step 14. Obtain Property Options

Following completion of the Design Report and acceptance of recommendations for property acquisition, Project Co-ordination Branch would request the Ministry of Government Services to proceed to obtain options on the recommended site or alternative sites. The option provides protection of a site(s) during the remainder of the design process and allows access for site investigations. In rapidly urbanizing areas, this will be the only feasible method of protecting sites until approval for land acquisition is received. Since the option is entirely voluntary on the part of the landowner, it does not constitute a significant impact. Where the design solutions would be accommodated on property currently under the Ministry's or other public jurisdictions, this step would, of course, not be necessary.

Step 15. Mandatory/Optional Public Hearings under O.W.R. Act

Once any necessary property options have been obtained, Project Co-ordination Branch will initiate the *mandatory* public hearing required under Section 43(1) of the Ontario Water Resources Act *if* the Design solution(s) involve *establishing or extending the sewage works* serving a particular municipality *in or into another* municipality or territory without municipal organization.

Project Co-ordination Branch may initiate an *optional* public hearing as provided for under Section 44(1) of the Ontario Water Resources Act *if* the Design solution(s) involve *establishing or expanding a sewage treatment works* within the municipality.

Where the public hearing is *optional*, project Co-ordination Branch will request the Region's recommendation as to whether or not a public hearing should be held. If the Branch and Region agree that a public hearing is *not* necessary, Project Co-ordination Branch will write the Director, Environmental Approvals Branch, Ministry of the Environment, requesting his concurrence in this regard.

Where the public hearing is mandatory or where an optional public hearing has been recommended, Project Co-ordination Branch will compile and submit all necessary documents to the Director, Environmental Approvals Branch and ask him to direct the *Environmental Assessment Board* to hold a public hearing, as provided under Section 9a(10) of the Ontario Water Resources Act. Project Co-ordination Branch staff will then attend the hearing.

When the Environmental Assessment Board has recommended approval of the Design site(s) and the Director of the Environmental Approvals Branch has concurred with the recommendation, Project Co-ordination Branch will advise the municipality of the decision.

Step 16. Certificate of Approval Issued with Conditions

This step involves the *technical* approval of the project design. The consultant submits the Design Report to Project Co-ordination Branch and Project Co-ordination Branch distributes copies to various personnel and Sections within the Branch, to the respective Regional Office and to such other parties as are appropriate (e.g., municipality, other Ministry of the Environment branches, other provincial agencies). Where a Regional Municipality is involved, it is not part of the review group, but the Regional Office consults with appropriate staff in preparing its comments. Each reviewing party forwards its comments to each other party. Project Co-ordination Branch may hold a meeting to resolve any conflicting comments before compiling the comments.

Project Co-ordination Branch then compiles the comments and forwards these to the consultant, with copies circulated to the Regional Office and various Branch staff. A meeting may be arranged between the consultant and personnel of the Branch and the Regional Office. If an addendum to the Design Report is requested, this addendum is distributed to the review parties for comment.

When the Design Report is considered technically satisfactory by Design and Equipment Section and all administrative forms have been completed, Project Co-ordination Branch requests the Environmental Approvals Branch to issue a "*Certificate of Approval With Conditions*" for the design(s). The "conditions" typically require approval of the Final Design for the project.

Step 17. Municipality Approves Financial Arrangements

Project Co-ordination Branch, with the assistance of the Regional Office and Financial Services Branch, will prepare a financial analysis for the project. Application will be made for funding assistance under the federal 'Community Services Contribution Plan' (Central Mortgage and Housing Corporation) where the specific project meets the eligibility criteria. The financial analysis and a proposal for provincial-municipal cost-sharing will be submitted for approval by the Assistant Deputy Minister, Environmental Assessment and Planning Division, Ministry of the Environment.

After approval has been obtained, the financial proposal will be forwarded to the municipality. The municipal Council will be requested to pass an appropriate by-law agreeing to the financial proposal (as required under Section 64 of the Ontario Municipal Board Act) to obtain authorization for any necessary frontage assessments or changes in the municipal mill rate (i.e., basis for property tax).

Step 18. Public Hearing (O.M.B.) Where Necessary

On receipt of the municipal by-law, Project Co-ordination Branch will submit the by-law, the municipal affidavit and summary of public responses, if any, (as provided by the municipality) to the Ontario Municipal Board. The Board's authorization (under Section 64 of the Ontario Municipal Board Act) is required for any necessary frontage assessment charges or changes in the municipal mill rate (i.e., basis for property tax) needed to fund the project.

The Ontario Municipal Board may decide to approve the financial arrangements as set forth in the by-law and associated documents *or* determine that a public hearing is required. A public hearing would normally only take place where the Board considered serious public concern regarding the project and the financial arrangements to be evident.

If a hearing is required, Project Co-ordination Branch will collate the appropriate documentation for the hearing (e.g., Conceptual Brief, Design Report, property information, updated pollution survey obtained from the Region) and Branch staff will attend the hearing. The municipality will be advised to advertise the date, time and location of the public hearing.

In some instances, the proposed site(s) may not be properly zoned for the proposed improvements. Project Co-ordination Branch would request the municipality to revise its Zoning By-laws and Official Plan to allow for the proposed uses. It would be the municipality's responsibility to initiate a public hearing before the Ontario Municipal Board in this regard (under Section 35 of the Planning Act, 1970).

Step 19. Execution of Legal Agreements

Following receipt of any necessary Ontario Municipal Board Approvals, Project Co-ordination Branch will prepare and submit to the municipality such legal agreement documents as are required. These documents will subsequently be executed by the Minister of the Environment. A Ministry press release is also normally issued at this point indicating the nature of the proposed project. Once this step is completed, the project proceeds to the Final Design Stage.

In this Stage, project design proceeds to the extent necessary for award of construction contracts. This involves the preparation and approval of all drawings, construction specifications and tender documents, etc. The project proceeds to implementation only after Final Certificates of Approval have been issued. It is in this final Stage that the Environmental Study Report is prepared and submitted.

It is important to note that the design(s) examined in this Stage *must* *comprise* one of the "Alternative Methods of Carrying Out the Undertakings" for this Class Environmental Assessment document to apply. If Project Co-ordination Branch decides, after the previous Design Report, to proceed with one of "The Alternatives to the Undertakings" this Class Environmental Assessment does *not* apply and correspondingly, an Environmental Study Report will not be prepared.

Assuming that the design of the expansion or upgrading project is examined further, this Stage of the Design Process will typically consist of 11 'steps' grouped into the following two 'phases':

Phase One: Final Plans and Specifications Prepared

Phase Two: Approval of Final Plans and Specifications

These phases and the corresponding major documents are illustrated in Figure 1.

Phase One: Final Plans and Specifications Prepared

This phase will typically comprise the following four steps:

Step 20. Execution of "Engineering Agreement"

After all necessary legal agreements between the province and the municipality have been executed, Project Co-ordination Branch prepares and arranges execution of an "Engineering Agreement" with the consultant covering final design and supervision of construction for the project.

Step 21. Pre-Design Meeting

Project Co-ordination Branch arranges a meeting between the consultant and staff of the Branch, the Regional Office, representatives of the Environmental Assessment Section, Environmental Approvals Branch, other Ministry branches, and other provincial agencies (e.g. Ministry of Transportation and Communications regarding alignment of sewers in public road allowances).

The purpose of the pre-design meeting is to bring all parties up to date on the project, to identify any potential problems and to determine the nature of any further technical investigations necessary (e.g. test drilling, soils, mapping, property or environmental).

Design and construction phasing for the project is also discussed. The Regional Office representatives provide comments on the Region's preference with respect to site and structural layout and on matters affecting the operation of the planned improvements. A schedule for the various Final Design phases up to the date of advertising for tenders is also normally prepared and agreed to by all parties.

Step 22. Refinement of Design

Where necessary, additional engineering and environmental data is acquired in order to update the work undertaken in previous Stages and to provide additional detail required for this Stage. The additional information may be related to such factors as foundation and trenching conditions, utility location, property surveys and any further environmental investigations that were identified in the Design Report.

On the basis of such additional information and further technical design work, the design(s) will be refined and finalized, including such aspects as sewer location, cuts and fills, layout of sewage treatment facilities, structural and equipment design, property requirements, drainage requirements. The design(s) will also be modified to incorporate such mitigative measures for potential environmental impacts as can be translated into design standards or layout and which are considered technically feasible and acceptable in terms of cost.

The specific construction specifications for the design(s) will also be detailed in this step, including those specifications necessary to mitigate any adverse environmental impacts documented in the Design Report and/or identified in this step.

Decisions as to whether or not design modifications are required and as to the selection of construction specifications in order to minimize adverse environmental impacts will be based on an analysis of such factors as:

- . the 'type', 'duration', 'reversibility' and 'severity' of the adverse environmental impacts
- . the latest available and approved design technology
- . the cost of implementation of such measures

The selection of any necessary design modifications and construction specifications necessary to minimize any adverse environmental impacts will be based on this analysis and the judgement, knowledge and experience of the responsible project staff. External agencies which expressed concern at the Pre-Design Meeting about specific environmental impacts will be consulted regarding the remedial measures being proposed for use.

Appendix IV illustrates the broad range of remedial measures that may be used to mitigate adverse environmental impacts. The *specifics* of such

remedial measures will be documented in the Environmental Study Report for a particular project but are not defined in this document for several reasons as follows:

- . The duration and significance of any particular impact and the appropriateness of any particular protective measure are dependent on the actual circumstances of an expansion or upgrading project.
- . There are many different measures or variations of any measure which may mitigate a certain impact depending on the nature and location of the expansion or upgrading project.
- . The remedial measures available are increasing as new methods are applied and as technology improves.

The consultant will finalize, for submission to Project Co-ordination Branch, all drawings, quotation documents for equipment selection, construction specifications and tender documents. In addition the consultant will prepare, for submission to Project Co-ordination Branch, a "Design Brief" which summarizes the technical design criteria and the work undertaken to date.

Step 23. Prepare Environmental Study Report

The Environmental Study Report is prepared at that point in the Final Design Stage when the specific construction specifications for mitigating any adverse environmental impacts have been determined and detailed.

This report may comprise part of the Design Brief or form an independent document, depending in part on the complexity of the project and therefore on the probable length of the report.

The Format and Content of this report will normally follow the general outline provided in "Part III - Environment Study Report" of this document.

Phase Two: Approval of Final Plans and Specifications

This phase typically comprises the following six steps:

Step 24. Internal Approval of Final Plans and Specifications

The consultant submits the Design Brief, the Environmental Study Report and all other drawings, tender documents and specifications to Project Co-ordination Branch for review. Project Co-ordination Branch distributes copies to various Branch personnel and Sections, the Regional Office and potentially to other Ministry of the Environment branches which may be involved in the review. Each reviewing party forwards its comments to each other party. Project Co-ordination Branch may hold a meeting to resolve any conflicting comments before compiling the comments.

Project Co-ordination Branch then compiles the comments and forwards these with any requests for changes to the consultant, with copies sent to appropriate Branch personnel and Sections and to the Regional Office. If a meeting with the consultant is considered necessary, the Regional Office is invited to attend in addition to various Branch staff members.

Project Co-ordination Branch checks the "Revised Final" set of tender documents to ensure corrections are appropriate and circulates copies of the documents to the Regional Office. If further corrections are required, Project Co-ordination Branch determines whether a third submission is required or whether the corrections can be handled through an addendum during the tendering period. At this point, an update of estimated costs for the various items is requested from the consultant.

Step 25. Acquisition of Property

Where additional property is required to accommodate the expansion or upgrading and the exact locational requirements are known as a result of final design work, Project Co-ordination Branch will request the Ministry of Government Services to exercise the outstanding option-to-purchase.

Step 26. Submission of Environmental Study Report

After the Environmental Study Report has received internal approval, Project Co-ordination Branch forwards the report to the Environmental Assessment Section, Environmental Approvals Branch, along with a letter indicating that subject to receipt of the necessary Final Certificate of Approval, construction contracts will be tendered if written objection is not received within 30 days.

Other agencies or a member of the public will be notified that the Environmental Study Report is available for review at the appropriate Regional Office and the municipal office.

The 30 day period is intended to allow time for review of the Environmental Study Report before Project Co-ordination Branch proceeds to apply for the "Certificate of Approval". Following its review of the Environmental Study Report, the Environmental Assessment Section may conclude that:

- . the project(s) as proposed is satisfactory and complies with the conditions of approval of the Class Environmental Assessment document; or
- . the project(s) complies with the conditions of approval but that modification or expansion to the construction specifications are desirable to further mitigate impacts; or
- . the anticipated environmental impacts are of such a magnitude that the project should be "bumped-up" to an individual Environmental Assessment.

Following their review of the Environmental Study Report, and within the 30 day period, the Environmental Assessment Section, the other agencies,

or any members of the public may petition the Minister of the Environment to direct Project Co-ordination Branch to submit the proposed project(s) as an individual Environmental Assessment. Each party will be advised of their right to petition the Minister.

In the case where a request is made for modification of construction specifications, and this request is considered acceptable to Project Co-ordination Branch, an addendum to the Environmental Study Report will be prepared and submitted (refer to Part III-3, "Revisions and Addenda" to the Environmental Study Report). Copies of the addendum will be sent to all parties who received copies of the full Environmental Study Report.

Step 27. External Approvals for Design Revisions (O.M.B.) Where Necessary

In some instances, the municipality may request that significant changes be made in the final design. For example, the municipality may request addition to or deletion of a portion of the planned sewer works due to unanticipated changes in demand for development in the community.

In such situations, Project Co-ordination Branch will request that municipal Council pass an amending by-law giving municipal agreement for the revised project. The municipality will be advised to advertise this by-law, collate all responses to the advertisement and submit the by-law, appropriate affidavit and other necessary documents to the Ontario Municipal Board.

Project Co-ordination Branch will advise the Ontario Municipal Board of the revisions to the project. The Board may accept the revisions as shown or determine that an additional public hearing is required, normally only where the revisions are extensive.

Where the requested revisions to the project alter the design and/or the construction process as described in the Design Report and Environmental Study Report, an addendum to the Environmental Study Report will be prepared. Copies will be sent to all parties who received copies of the full Environmental Study Report and any previous addenda.

Step 28. Certificates of Approval

After the 30 day period has elapsed, and the Final Design is considered technically satisfactory by the Design and Equipment Section and all necessary administrative formalities for the Certificate of Approval have been completed, Project Co-ordination Branch requests the Environmental Approvals Branch to issue the Certificate of Approval (refer to Step 16).

Step 29. Tendering of Project

Project Co-ordination Branch arranges for the calling of tenders, subject to any required property negotiations being completed. If any addenda to the tender documents are found to be necessary, these are forwarded to various Branch staff and to the Region as they are prepared.

A recommendation will be made for award of the construction contract(s). The contract is normally but not necessarily awarded to the lowest bidder.

*Step 30. External Approvals for Revised Financial Arrangements
(O.M.B.) Where Necessary*

In some instances, the costs of implementing the expansion or upgrading project will have changed significantly due to revisions in the final design (refer to Step 27). The costs may also have altered significantly due to an extensive time lag occurring between the Design Report and Final Design stages.

In these situations, Project Co-ordination Branch, with assistance from the Regional Office and Financial Services Branch, will prepare a revised financial analysis for the project. This analysis will take into account any applicable funding to be received by the federal 'Community Services Contribution Plan' (Central Mortgage and Housing Corporation). The revised financial analysis and a proposal for provincial-municipal cost-sharing will be submitted for approval by the Assistant Deputy Minister, Environmental Assessment and Planning Division, Ministry of the Environment.

After this approval has been obtained, the revised financial proposal will be forwarded to the municipality. The municipal Council will be requested to pass an appropriate by-law agreeing to the financial proposal. The municipality will be advised to advertise the by-law and to collate all responses.

Project Co-ordination Branch, on receipt of the by-law, will advise the Ontario Municipal Board of the revised financial arrangements. The Board may accept the changes as shown or determine that another public hearing is necessary. This would normally only occur where the change in costs was extensive. *A public hearing before the Board would normally consider both the design revisions and changes to the financial arrangements. Two public hearings would not normally take place for Steps 27 and 30, respectively.*

After all the above applicable steps have been completed, Project Co-ordination Branch will issue a "commence work" order and the implementation of the expansion or upgrading project will commence, as described in the next Section of this document.

This stage involves the actual construction of the expansion or upgrading project on-site according to the contract specifications developed and approved during the Final Design Stage.

The process of construction will vary to some extent depending on the construction firm which is carrying out the work. Contractors differ in terms of sequence and methods of operation, speed of operation and the type, make and size of equipment. There is, however, a fairly general uniformity in construction operation as a natural result of the intense economic competition in the industry.

The process of construction will also vary depending on the specific expansion or upgrading project. Projects in this Class involve a wide range of construction activities from the installation of a length of sewer to the construction of large reinforced concrete tankage and other structures associated with a treatment facility. Consequently, the choice of construction methods and the range of construction equipment used can be quite extensive. As well, only one construction method is often applicable for a particular activity. *Figure 3* summarizes the typical activities and equipment associated with implementation of expansion or upgrading projects. Not all of the activities described will necessarily apply to a specific project nor will the activities necessarily take place in the sequence indicated.

The environmental impacts associated with the activities described in *Figure 3* are typically localized, of short duration and are an inherent aspect of construction activity. Construction will result to varying extents in noise, dust, fumes, odour and potentially may cause some inconvenience to the travelling public and adjacent residents or other uses. Short-term hazards to watercourses may be associated with excavating or trenching activities due to potential erosion and deposition of sediments and due to dewatering. Visual intrusion as a result of stockpiled materials and equipment, temporary buildings, unfinished structures and devegetated soil may also occur.

To minimize any potential impacts, the contractor is required to implement those applicable remedial measures set forth in the Environmental Study Report and incorporated into the construction specifications. These may include, for example, the use of equipment with up-to-date emission and noise control features, specific erosion control and dewatering procedures, and prohibitions on stockpiling/storage of equipment in certain site locations. As a matter of standard practice Project Co-ordination Branch will implement, in a manner and with specific provisions applicable to the particular project, the Ministry of the Environment guidelines set forth in the February 1977 document entitled, *"Environmental Considerations for the Planning and Construction of Provincial Sewer and Water Projects."*

FIGURE 3

TYPICAL CONSTRUCTION ACTIVITIES
ASSOCIATED WITH IMPLEMENTATION OF
EXPANSION AND/OR UPGRADING PROJECTS

<u>Activity and Typical Sequence</u>	<u>Equipment Used</u>
1. On-site construction detours (e.g., pedestrian and vehicle)	grading of temporary roadways, emplacement of barricades, walkways
2. Installation of temporary buildings (e.g., prefabricated, trailers)	flatdeck trucks, cranes
3. Demolition of existing buildings, if required	dump trucks, heavy duty refuse containers, assorted demolition equipment
4. Clearing	chainsaws, axes, shears, bulldozers, dump trucks
5. Grading	scrapers, bulldozers, graders
6. Excavating, trenching, draining	back hoes, power shovels, front-end loaders, dump trucks, blasting equipment, pile driver (if sheet piling required), pumps with intake and discharge piping
7. Placing of bedding material (native material, granular base, concrete) and laying of pipe, where appropriate to project	back hoes, crane, front-end loaders, dump trucks, ready-mix concrete trucks, graders, compaction equipment
8. Construction/installation of manholes and chambers <i>and/or</i> Erection of formwork and fixing of steel, pouring of concrete, stripping of formwork, installation of roof, exterior/interior finishing	back hoe, crane, ready-mix concrete trucks crane, ready-mix concrete trucks, concrete placing equipment (e.g., vibrators), flatdeck trucks, tarring equipment, front-end loaders, compressors, hand tools
9. Backfilling	back hoe, front-end loaders, compaction equipment, ready-mix concrete trucks, dump trucks
10. Final grading and paving (where applicable)	scrapers, bulldozers, graders, asphalt spreaders, compaction equipment, dump trucks
11. Fencing and Illumination	tractor with power auger, steel post driver, fence stretcher
12. Landscaping	small bulldozers, front-end loaders, dump trucks, tractors with back hoes, flatdeck trucks

The contractor is required to perform the work in accordance with the contract documents. Qualified staff of the consulting engineering firm responsible for implementation supervises all phases of the work. Project Co-ordination Branch are kept informed of progress and problems through regular reports which are filed by the Construction Supervisor.

During construction, however, two situations may result in deviations from the environmental protection measures set forth in the construction specifications. These circumstances are as follows:

a. *Contractors Method of Operation*

The contractor may follow the contract documents explicitly but, by his method of operation, violate the intent of the environmental aspects of the construction specifications. The Construction Supervisor will discuss problems of this nature with the contractor and direct him to alter operations to avoid potential damage to the environment.

b. *An Unforeseen Occurrence*

Occasionally a situation develops during the course of construction which has not been covered in the contract documents. When this occurs and is considered likely to result in significant adverse environmental impacts, the Construction Supervisor will notify Project Co-ordination Branch and appropriate changes in the construction process, activities, location or timing will be undertaken on site. If the unforeseen situation relates to an area of concern identified previously by an external agency, the relevant agency will be contacted.

Where the environmental impacts associated with the above two situations are considered significant, Project Co-ordination Branch will prepare an Addendum to the Environmental Study Report and submit it to the Environmental Assessment Section, Environmental Approvals Branch (refer to Part III-3, Revisions and Addenda).

II-6 INVOLVEMENT OF THE PUBLIC IN THE DESIGN PROCESS

For most expansion and upgrading projects in this Class, public involvement in the design process, as undertaken by Project Co-ordination Branch, will be limited to contacts with adjacent property owners (i.e., to minimize potential construction disturbances). Further contact with the public may be initiated with respect to certain complex projects or where a considerable level of public concern and interest in the project has been expressed. The potential nature of these contacts is described in the first and second subsections below. In addition, the municipality will solicit responses from its citizens as described in the third subsection below.

1. Contacts to Obtain Information (Mandatory)

In many instances, local interest groups such as naturalists' clubs, fishing clubs, etc., and individual local residents have specific knowledge of study area conditions that are pertinent to the project. This information may not be available from other provincial agencies or may be more up-to-date and detailed than the data contained in public agency files. Such groups and individuals typically will be identified by the consultant during preparation of the Conceptual Brief. Information would typically be solicited from these sources during the following design process steps:

- . during preparation of the Conceptual Brief (Step 9)
- . while 'investigating conditions in the study area' (Step 11)

2. Information Centres (Optional)

Project Co-ordination Branch may choose to advertise and hold public 'information centres' to obtain public comment on the proposals. This form of public involvement will not be common for upgrading or expansion projects in this Class. Such meetings will probably only be held where the Branch and the municipality involved consider it warranted in light of the complexity of the proposed improvements and where extensive public concern and interest has been expressed.

The most appropriate timing for any public information centres initiated by Project Co-ordination Branch would be:

- . following preparation of the Conceptual Brief (Step 9)
- and/or*
- . after the 'alternative design solutions' have been developed (Step 12)

Members of the public will be advised that a design report and an Environmental Study Report will be prepared and that both reports will be available for their review at the appropriate Regional Office or municipal office.

3. Contacts Made by the Municipality

Project Co-ordination Branch will advise the municipality to notify the public of its intention to pass a by-law confirming the need for the improvements and/or agreeing to the provincial-municipal cost-sharing arrangements for the project. Normally, the municipality will advertise in the local newspaper the date on which Council will consider the by-law in open session. The municipality may also choose to hold a public meeting or request written briefs prior to considering the by-law.

Thus, the public has the opportunity to comment on the project at the following steps in the design process (where applicable to the specific project):

- . during the preparation of the Conceptual Design or when the municipality agrees to the need for the improvements (Step 9 or alternatively, Step 4)
- . when the 'Municipality Agrees to Financial Arrangements', (Step 17)
- . during the Final Design Stage when any revisions to the design or to the financial arrangements are approved by the municipality (Step 27 and 30, respectively)

In addition, the public has the opportunity to express its opinions at any necessary public hearing before the Environmental Assessment Board (Step 15) or before the Ontario Municipal Board (Step 18, as part of Steps 27 and 30, respectively).

II-7 INVOLVEMENT OF OTHER AGENCIES IN THE DESIGN PROCESS

Project Co-ordination Branch liaises with the municipality, the Regional Office and other branches of the Ministry of the Environment at various points in the overall design process as discussed in the preceding Sections.

For most expansion or upgrading projects, other provincial (and in some cases federal) agencies will be involved in the design process. The extent of this involvement will vary, depending on the nature and location of both the problem(s) and the existing sewage system, the specifics of the expansion or upgrading project and the applicable jurisdiction, programs, location and administrative structure of the other agencies.

Two types of contact may be undertaken with other agencies as is appropriate to the particular project, namely:

- . contacts to obtain information for the various design stages (optional)
- . contacts to obtain comment on the design or design alternatives under consideration (mandatory)

The other agencies which will be contacted during the design process will normally be identified by the consultant at the beginning of Preliminary Design. Other affected/concerned agencies may also be identified in later stages as the investigations become more detailed. The various points in the design process at which the two types of contact may occur are described in the following subsections.

1. Contacts to Obtain Information (Mandatory)

Depending on the specific project under consideration, representatives of other agencies will be contacted to provide information required for the various sequential steps of the design process. For example, the Ministry of Transportation and Communications and the various utility companies may be asked to provide information on planned improvements in the area affecting public roadways, and for survey drawings. Floodplain, hazard land and slope mapping may be obtained from the Conservation Authority. Data on natural and physical environmental factors may be gathered from various branches of the Ministry of Natural Resources. Other provincial agencies may be requested to provide details of current programs, plans and data files for the area (e.g., location of heritage resources from Ministry of Culture and Recreation).

There are a number of potential steps in the design process during which information may be requested from other agencies, as follows:

- . as input to the Regional Office report (Step 2)
- . during preparation of the Conceptual Brief (Step 9)
- . while 'investigating conditions in the study area' (Step 11)
- . when 'Refinement of the Design' is being carried out (Step 22)

2. Contacts to Obtain Comments (Optional)

The points at which other agencies will be requested to comment on the investigations will also vary depending on the specifics of the particular expansion or upgrading project. For many projects in this Class, some contact will be necessary to ensure that both the technical aspects and the proposed environmental protection measures are satisfactory in terms of the jurisdictions and responsibilities of other agencies.

For particularly complex or sensitive projects, Project Co-ordination Branch may form a 'technical advisory committee' which would provide input to each design stage. In most cases, however, comments would be obtained on an individual basis from the respective agencies as necessary.

The various points in the design process where representatives of other agencies will be requested to comment on the project include:

- . during the preparation of the Conceptual Brief (Step 9)
- . in evaluating the Design Report prior to issuance of Preliminary Certificates of Approval (Step 13)

- . as input to the Pre-Design Meeting (Step 21)
- . review of the Environmental Study Report (Step 26)

In addition, the consultant may solicit and take into account additional comments of other agencies' representatives during preparation of the Conceptual Brief, Design Report and Design Brief documents pertaining to the project. During the Implementation Stage, the Construction Supervisor may also request other agencies' representatives to comment on any necessary modifications of the construction process or to advise him on-site regarding specific concerns.

II-8 INVOLVEMENT OF THE ENVIRONMENTAL ASSESSMENT SECTION, ENVIRONMENTAL APPROVALS BRANCH

There will be two types of contact with representatives of Environmental Assessment Section, Environmental Approvals Branch, with respect to the provisions of this Class Environmental Assessment document, namely:

- . contacts to request specific environmental information (optional and undertaken where appropriate)
- . contacts to provide notification of the project and to submit the Environmental Study Report (mandatory)

1. Optional Contacts

The liaison representation of the Environmental Assessment Section, Environmental Approvals Branch may be requested to assist with identifying potential information sources at any of the following steps:

- . during preparation of the Conceptual Brief (Step 9)
- . while 'investigating conditions in the study area' (Step 11)
- . when 'Refinement of the Design' is being considered (Step 22)

2. Contacts to Obtain Comments

In addition to the mandatory points of contacts identified for other agencies in Section II-7, which also apply to the Environmental Assessment Section, Environmental Approvals Branch, this Section will be notified about the proposed undertaking as follows:

(a) *Notification of Project*

Project Co-ordination Branch will send a letter to the Environmental Assessment Section, Environmental Approvals Branch after

completion of the Preliminary Design (Step 16). Where a "Conceptual Brief" has been prepared, the Environmental Assessment Section will be notified following acceptance of the Brief (Step 10).

This letter will convey such information as:

- . notification that the Conceptual Brief or Preliminary Design pertains to an expansion or upgrading project in this Class
- . specific location of the proposed project
- . a brief description of the problem(s) identified and the rationale for the improvements to the existing sewage system
- . an indication of the scope and complexity of the conceptual design or design alternatives
- . names of Project Co-ordination Branch personnel involved in the project
- . an indication of the probable extent of involvement of the public and of other provincial agencies, if any

The letter will also request the name of the staff member of Environmental Assessment Section, Environmental Approvals Branch who will be responsible for any on-going liason necessary during the project. As well the letter will request notification of any points of contact with this representative that are considered necessary.

(b) *Submission of Environmental Study Report*

Once the Environmental Study Report has been completed and accepted, the Project Co-ordination Branch will submit the report to the Environmental Assessment Section and advise of its intention to initiate construction of the project as an undertaking within this Class, subject to receipt of the necessary Final Certificate of Approval.

II-9 PROVISION FOR REVIEW OF THE PROJECT

In some cases, a significant time lapse may occur between the completion of the Final Design Stage and the actual implementation of the project. A review of the design is carried out in such instances to ensure that

the technical aspects of the design and the environmental protection measures are still valid. Where modifications of the environmental protection measures are still valid. Where modifications of the environmental protection measures are considered, these revisions will be reviewed with the Environmental Assessment Section, Environmental Approvals Branch to assess the implications of the proposed changes.

PART III - ENVIRONMENTAL STUDY REPORT

III - 1 INTRODUCTION

An Environmental Study Report will be prepared for each expansion or upgrading project in this Class which proceeds to implementation.

The Environmental Study Report will be submitted to the Environmental Assessment Section, Environmental Approvals Branch of the Ministry of the Environment. This is the provincial agency responsible for administering the Environmental Assessment Act 1975.

Project Co-ordination Branch will notify any agency or individual who has expressed an interest during the study process, that the Environmental Study Report will be available for review at the appropriate Regional Office and municipal office.

The Environmental Study Report will be submitted to the Environmental Assessment Section, Environmental Approvals Branch, at least 30 days prior to the advertising for tenders for the project. This 30-day minimum period provides time for review of the report by the above agency. Project Co-ordination Branch may advertise for tenders on the project when a written objection has not been received from the Environmental Assessment Section, Environmental Approvals Branch within 30 days.

The Environmental Study Report will be finalized and submitted when the details of any environmental protective measures to be incorporated into the construction contract specifications have been determined. This will normally mean that the report will be submitted during the *Final Design Stage* of the overall Design Process.

The Environmental Study Report will summarize and document the work undertaken in the Design Process, including:

- . the purpose and rationale for the expansion or upgrading project
- . alternative methods of carrying out the undertaking
- . the physical, natural, social and engineering environmental conditions of the project area
- . an evaluation of the potential impacts on the environment of the undertaking, the alternative methods of carrying out the undertaking and of the alternatives to the undertaking

- . the financing arrangements for the project
- . the basis for recommendation of the expansion or upgrading project
- . any special provisions which will be incorporated into the contract specifications in order to mitigate identified/potential adverse environmental impacts

III-2 FORMAT AND CONTENT OF THE ENVIRONMENTAL STUDY REPORT

The format of an Environmental Study Report prepared for a project in this Class will generally follow the outline of the five chapters listed below:

1. Background Information
2. Summary of the Design Process
3. Existing Conditions
4. Alternatives and Evaluation
5. The Expansion and/or Upgrading Project

In addition, the report will include such appendices as are appropriate for the particular project.

The typical content of the report chapters and appendices are discussed in the following subsections.

Chapter One: Background Information

1.1 *Purpose of the Report*

This first section will describe, in general, what the particular Environmental Study Report represents in terms of the Environmental Assessment Act 1975. For example, the section might include the following paragraphs:

"This Environmental Study Report represents the documentation of the environmental assessment process undertaken for a specific project to upgrade and/or expand an existing sewage treatment system under the jurisdiction of the Ministry of Environment. A Class Environmental Assessment has been accepted and approved by the Minister of the Environment for projects of this type."

"An Environmental Study Report documents the overall design process which terminates with the construction of a specific project. It includes a discussion of project purpose and rationale; the existing physical, natural, social and engineering conditions in the project area; alternative solutions (other than the project) for meeting the identified need(s); the alternative methods of carrying out the project; and the specific construction requirements necessary to mitigate identified adverse environmental impacts."

"This Environmental Study Report has been submitted to Environmental Assessment Section, Environmental Approvals Branch, which is the agency of the Ministry of the Environment responsible for administering the Environmental Assessment Act 1975. Project Co-ordination Branch will proceed to advertise for tenders for this project if written objection has not been received from the above agency within 30 days of the date of submission of this report."

1.2 *Location of the Undertaking*

This section will typically include:

- . a description of the defined limits of the undertaking (i.e., a general locational description, not a legal description)
- . a map showing the location of the undertaking and a key diagram illustrating regional locale

1.3 *Purpose of the Undertaking*

Outlined in this section would be:

- . a description of the specific identified problems in the existing sewage system, e.g., as associated with public health, effluent quality, system capacity, potential system failure, disposal/utilization of sludge, need for design improvements/new technology
- . the specific objective of the undertaking, e.g., "to expand system capacity in order to provide treatment for ~~xxx~~ m³/h (cubic metres per hour) of sewage"

1.4 *General Description of the Undertaking*

The characteristics of the specific expansion and/or upgrading project(s) which have been selected to solve the problem(s) will be summarized in this section, and may include, for example:

- . name of the specific sewage system or its components
- . significant technical features of the undertaking

- . anticipated environmental condition changes and mitigative measures to be implemented as part of construction specifications

1.5 *Rationale for the Undertaking*

This section will state why the planned undertaking, as described in Section 1.4, will achieve the objective and meet the need(s) described in Section 1.3 of the Environmental Study Report.

1.6 *Related Studies*

Previous financial, operational, land use or environmental studies which are relevant to or related to the undertaking or the study area are noted and significant data documented.

1.7 *Related Environmental Assessment Documents (where applicable)*

This section will indicate, where applicable, those Environmental Assessment documents which are related to the undertaking, including:

- . the date of submission to the Ministry of the Environment, if still pending
- . date of approval by the Minister of the Environment and Order-in-Council number
- . the need and justification for the undertaking, if appropriate
- . specific pages in the Environmental Assessment document(s) may be referred to, where appropriate

Chapter Two: Summary of the Design Process

The purpose of this chapter is to *summarize* the proponent's decision-making process which resulted in a recommendation to undertake the specific expansion and/or upgrading project(s). A brief description is provided of the manner in which these were selected. This would include items such as:

2.1 *The Environmental Assessment*

This section will briefly describe how the environmental assessment of the project was carried out. It will include a short discussion of:

- . data collection
- . data analysis and evaluation of impacts

The above deals with the topic in general, and any detail is documented in the appropriate subsequent chapters, e.g., "Existing Conditions", "Alternatives and Evaluation".

2.2 *Project Stages and Organization*

The proponent herein provides explanation of:

- . project time frame for design and construction
- . project organization - project team, external input, etc.

2.3 *Internal Participation*

Ministry of the Environment offices, branches and sections which were involved in the project are identified and the type and extent of their involvement described, e.g. "memorandum on operating problems - Regional Office".

2.4 *External Participation*

The names of those persons who were involved in the project on behalf of the following agencies and the type and extent of their involvement will be documented, e.g.,

- . provincial ministries, agencies
- . municipal and provincial elected officials
- . municipal technical staff

2.5 *Public Involvement*

The type of public participation, the extent, the number of meetings, who was invited, how notification of meetings was made, etc., will be documented.

Chapter Three: Existing Conditions

The purpose of this chapter is to briefly describe the existing physical, natural, socio-economic and engineering conditions in the study area to the extent appropriate for the particular location and nature of both the existing sewage system and the expansion and/or upgrading project(s).

The information conveyed in this chapter should clearly indicate the inter-relationships between various condition factors, e.g., the relationships of natural environmental or socio-economic conditions to engineering conditions. The information included in this report will typically be arranged in four sections, as follows:

3.1 *Physical Environment*

This section will briefly describe those existing physical conditions relevant to the project area and the project, e.g., bedrock

geology, surficial geology, surface and subsurface drainage, topography and landforms, air quality, ambient noise levels, water quality, climatic features.

3.2 *Natural Environment*

The factors described in this section, as appropriate to the project area and the project will include vegetation, wildlife populations and habitat characteristics (e.g., quantity and quality, sensitivity, etc.), aquatic life and habitat characteristics.

3.3 *Socio-economic Environment*

The description of socio-economic conditions of the project area will include such factors as existing land uses, cultural activities, heritage resources, proposed land uses and programs, 'community values'.

3.4 *Engineering Conditions*

The pertinent engineering conditions of the project area and the existing sewage system will be explained, including such factors as existing condition of the sewage system, hydraulic capacity, effluent quality, operational problems, geotechnical and drainage considerations, land area constraints.

Chapter Four: Alternatives and Evaluations

The purpose of this chapter is to document the various sets of alternatives that were considered in the Design Process, to rationalize trade-offs made in the evaluation and selection of an alternative(s) and, to identify any environmental concerns which influenced the selection of the recommended expansion and/or upgrading project(s).

4.1 *Alternatives to the Undertaking*

This section describes the alternative solutions, *other than* the expansion and/or upgrading project(s), which were considered as potential ways of resolving the identified problems.

The advantages and disadvantages of the alternative solutions are outlined with respect to the appropriate engineering, and physical, natural and socio-economic factors. This section also states how and why the specific alternative solutions were eliminated from further consideration (i.e., the evaluation process and its results).

4.2 *Alternative Methods of Carrying Out the Undertakings*

This section describes the various alternative *design solutions* that were considered for the specific expansion and/or upgrading

project(s). The advantages and disadvantages of the design alternatives are outlined with respect to the appropriate engineering, and physical, natural, and socio-economic factors. The evaluation process used to select the recommended design alternative is also described.

This section also describes any *alternative construction solutions* which were considered with respect to the design alternatives, including the recommended design, e.g., staging of construction, interim servicing, construction methods and timing.

The advantages and disadvantages of the construction alternatives are discussed, as are the potential effects on the natural and socio-economic environment of implementing or not implementing the construction alternatives. The evaluation process used to eliminate construction alternatives from consideration is also explained.

4.4 *Review of Identified Concerns*

The purpose of this section is to document any concerns of the public, provincial ministries/agencies and municipal agencies which influenced the selection of alternatives or project design and the steps taken to deal with these concerns.

Chapter Five: The Expansion and/or Upgrading Project(s)

The purpose of this chapter is to describe the recommended design for the expansion and/or upgrading project(s) and the specific requirements for its construction.

5.1 *Description of the Selected Design*

The specific engineering characteristics of the expansion and/or upgrading project will be explained. The information included in this section may include, for example, plans and profiles, property requirements, system components, staging of the expansion and/or upgrading work.

5.2 *Potential Environmental Effects of the Selected Design*

This section describes the potential direct and, where possible and appropriate, indirect and synergistic environmental effects, both positive and adverse, of the actual *design* of the expansion or upgrading project.

5.3 *Potential Environmental Effects of Construction*

This section will describe three interrelated factors as follows:

- . the specific construction requirements associated with implementation of the project, e.g., blasting, movement of large volumes of soil, dewatering
- . the potential direct and indirect environmental condition changes, both beneficial and adverse, associated with these specific construction requirements, e.g., soil erosion, alterations to water quality
- . the mitigative measures incorporated into the contract documents to minimize potential adverse environmental condition changes, e.g., use of temporary mulches, control of equipment movement and location, timing of the construction work, use of cofferdams and sediment traps

5.4 *Summary of Potential Environmental Effects*

This section will summarize the potential net environmental effects of the expansion and/or upgrading project(s), both beneficial and adverse, in light of the mitigative measures to be incorporated into the *design* of the project and into the *construction* contract specifications.

5.5 *Monitoring Programs*

For various projects in this Class, it may be necessary to establish monitoring programs to ensure that the *design* and *construction* mitigative measures have achieved the desired objectives. Such programs will be outlined in this report.

Appendices

The information contained in the appendices will, of course, vary for any particular project in this Class. The purpose of the appendices is to provide technical information which supports and further explains the discussions in the main text of the Environmental Study Report. The items in the appendices may, for example, include:

- . A1 - fold-out maps and plans
- . A2 - natural environment studies
- . A3 - socio-economic studies
- . A4 - evaluation table - for the "alternatives to the undertaking"
- . A5 - evaluation table - for the "alternative methods of carrying out the undertaking"
- . A6 - the selected design - specific design criteria

- . A7 - summary of concerns of other ministries or agencies and submissions made by individuals, citizens' groups and public agencies with respect to the project
- . A8 - list of applicable provincial Acts, and Ministry of the Environment policy documents and guidelines

APPENDICES

APPENDIX I

ILLUSTRATIONS OF PROCESSES AND
EQUIPMENT IN EXISTING SEWAGE SYSTEMS

Subsurface Disposal Systems

The purpose of a septic tank system is to return to the soil the sewage and other liquid wastes from the household in such a manner that ground-water does not become polluted and no sewage appears at the ground surface. The system consists essentially of two main parts:

- . the septic tank, which by settling out solids, prepares the sewage for absorption by the soil
- . the leaching bed where the liquid is treated and dispersed into the soil

The purpose of the septic tank is frequently misunderstood. Its main function is to remove from the waste, solids which would otherwise plug the leaching bed. Bacterial action breaks down much of the solid matter to liquids and gases, and in an efficiently operating tank, only a liquid is discharged to the leaching bed. This liquid is still highly charged with bacteria and nutrients. Sufficient capacity is provided in the tank for the retention of insoluble matter. The removal, when necessary, of sludge and scum from the tank should ensure its continued efficient operation.

The second part of the system is the leaching bed. It consists of lines of perforated or open jointed pipe, or of clay tile laid with open joints, located in trenches so that the liquid waste from the tank can pass into the soil where further treatment occurs, helping to purify the effluent so as not to contaminate ground or surface water. The perforated pipe or open jointed pipe or tile is referred to as the "distribution pipe" and is distinct from the solid pipe used in the system to transport the sewage to the leaching bed or as headers or connecting lines within the bed. The bacterial action in the leaching bed is aerobic, meaning that the presence of oxygen is necessary in the soil as the liquid filters downward through it.

Primary Treatment

Primary treatment is mechanical in nature. Settling tanks are used to remove the settleable solids, floating scum and grease from the waste water. This form of treatment is used only when it will meet the water quality requirements of the receiving body.

Settling tanks (clarifiers), equipped with sludge and scum removal mechanisms, provide a detention period of approximately two hours for

the incoming waste water. This detention period allows the waste particles to settle to the bottom of the tanks from where it is removed by pumps for conditioning prior to disposal. The sludge removed is pumped to a digester or other treatment facility, where it is processed or dewatered before final disposal.

Primary treatment usually precedes biological treatment, which is carried out in secondary plants.

To summarize, primary treatment removes the heavier particles, scum and grease from the waste water. The effluent produced is of a lower standard of quality than is achieved in complete treatment. The amount of solids removed ranges from 40 to 60 percent.

Lagoon Treatment

A lagoon treatment facility or waste stabilization pond makes use of natural purification by regulating such processes. For instance, in nature microorganisms, through time, react with organic material and break it down into carbon dioxide and microbial cell material which is nuisance free. Natural purification is achieved by microbes present in soil, by oxygen, by organic material (food for microbes) and dissolved materials working together.

In a stabilization pond, loading, depth, soil conditions and liquid losses (all of which are controlled) together with wind action, sunlight, algae growth and oxygen are contributing factors in providing the environment necessary for the development of the aerobic bacterial action and photosynthetic oxidation required to stabilize the wastes.

The microorganisms cultivated convert much of the organic carbon in the wastes to carbon dioxide. This carbon dioxide, together with dissolved minerals and sunlight, provides conditions for the growth of algae, which in turn provide a plentiful supply of oxygen for the microorganisms. When the organic materials have been converted into bacterial bodies, dissolved minerals and gasses, the stable liquid portion remaining is discharged to a receiving body or evaporates into the atmosphere.

To summarize, the waste water is collected in a lagoon where, by regulating the natural purification process, the organic materials are converted and the waste water is purified. This is accomplished in such a manner that no nuisance conditions develop.

A lagoon treatment facility may also be equipped with aeration devices to reduce the retention period. In this case, algae do not play a part in the oxidation process. The lagoon is equipped with a mechanical device that blows air into the contents or with paddles that continuously turn the contents about. This eliminates the need for prolonged retention of waste water by increasing the efficiency of the oxidation process.

Secondary Treatment

Secondary treatment processes may be added to a primary treatment facility to produce a higher quality effluent. It removes the finely divided, suspended and dissolved materials remaining in the waste water. Normally secondary treatment consists of aeration tanks or "basin" and a secondary settling tank.

Biological communities of microorganisms are developed and maintained in aeration tanks where they are supplied with a plentiful supply of oxygen. The air supply can be provided by compressed air, which is revolved and dispersed on the liquid surface to effect transfer of atmospheric oxygen into the tank's contents. Besides providing dissolved oxygen for the micro-organisms, the air, or agitation, also produces a roll in the tank and prevents settling of solids.

As the organic impurities are assimilated by the micro-organisms, the resulting sludge formation is light and flocculent and can readily be settled out in a secondary settling tank.

Tertiary Treatment

Secondary treatment plant effluents can create some undesirable conditions in some receiving streams through adverse effects on the dissolved oxygen levels, which result in unwanted changes in the living organisms of the streams. Also, these discharges can bring about excess growth of algae and other aquatic plants.

To arrest these conditions, an advanced type of treatment called tertiary is being developed as a third or "polishing" stage to follow conventional secondary treatment processes for the further reduction of organic content. This will improve receiving water conditions as far as the dissolved oxygen levels are concerned. Another important result of tertiary treatment is the reduction of nutrient levels which algae utilize for growth.

No tertiary treatment form is typical. This third stage of cleaning up waste water must be adapted to the particular need of the receiving water concerned.

Various Design Features of Primary/Secondary/Tertiary Treatment Facilities

Coarse Bar Screens:

A coarse bar screen is a protective screen installed at the influent (entrance) to the plant or pumping station to prevent the entry of large objects which could damage machinery or equipment.

Comminution

Comminuting (shredding) equipment is used to reduce large particles in the flow to a size suitable for handling in the treatment units. These units are installed ahead of or behind grit and sand removal facilities.

As the grit and sand settle, a suction pipe draws the contents from the bottom of the chamber and deposits it into channels or a hopper from where the water is returned to the flow and the grit, and sand collected for periodic removal. The turbulence of the water in the chamber keeps the organic material in suspension.

Effluent Filter:

Where required, a sand filter is installed to filter the effluent before it is discharged to a watercourse. When receiving waters are small or very low flows are encountered during the summer months, this method of "polishing" the effluent is very effective and ensures a high degree of removal of any waste materials remaining in the final effluent before discharge.

Chlorination:

Chlorinating facilities disinfect the effluent before discharge from a plant. In most cases a chlorine contact chamber serves this purpose. In this chamber the final effluent undergoes a detention period of 15 to 30 minutes to ensure good contact with the chlorine. The effluent outfall sewer, running from the plant to the receiving waters, is sometimes used to chlorinate the effluent in much the same way as the chamber process.

Various Sludge Treatment Processes at Primary/Secondary/Tertiary Treatment Facilities

Sludge is composed of solids removed from waste water by a treatment process.

Anaerobic Digestion:

Digestion is the decomposition, by anaerobic bacteria of settled solids or sludge removed from waste water. This is carried out in a digester, a special structure equipped with various piping and valve arrangements, and heat transfer equipment.

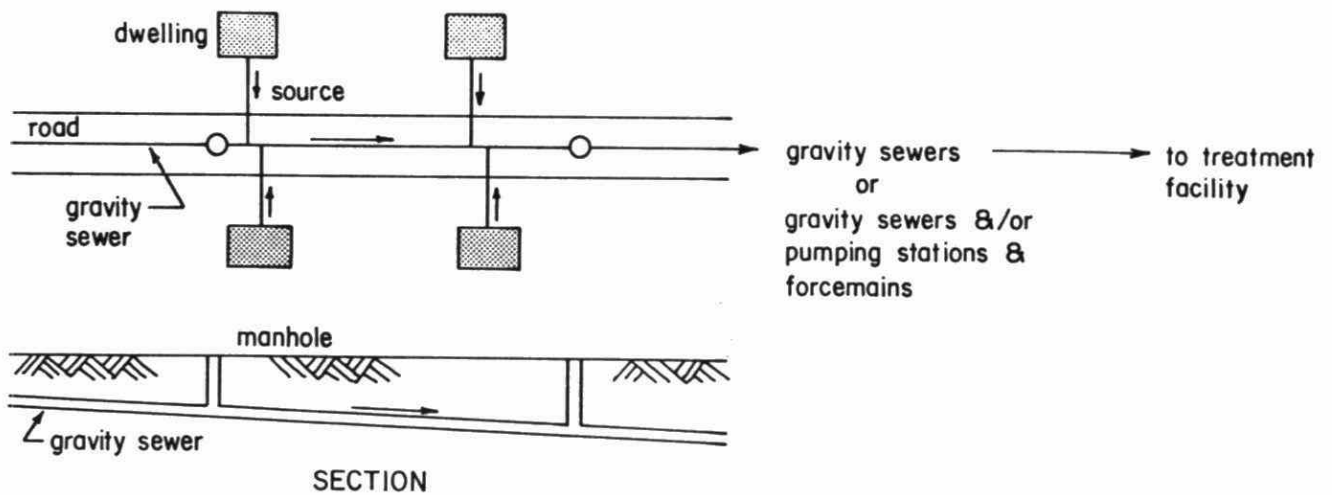
The raw sludge is pumped to the digesters where it is broken down by anaerobic bacterial action, at a regulated temperature of 90 to 95 degrees Fahrenheit. When it is thoroughly digested a thick black, odorless liquid remains which can be used as a soil conditioner.

A by-product of digestion - methane gas - is utilized as fuel for plant heat exchangers and boilers.

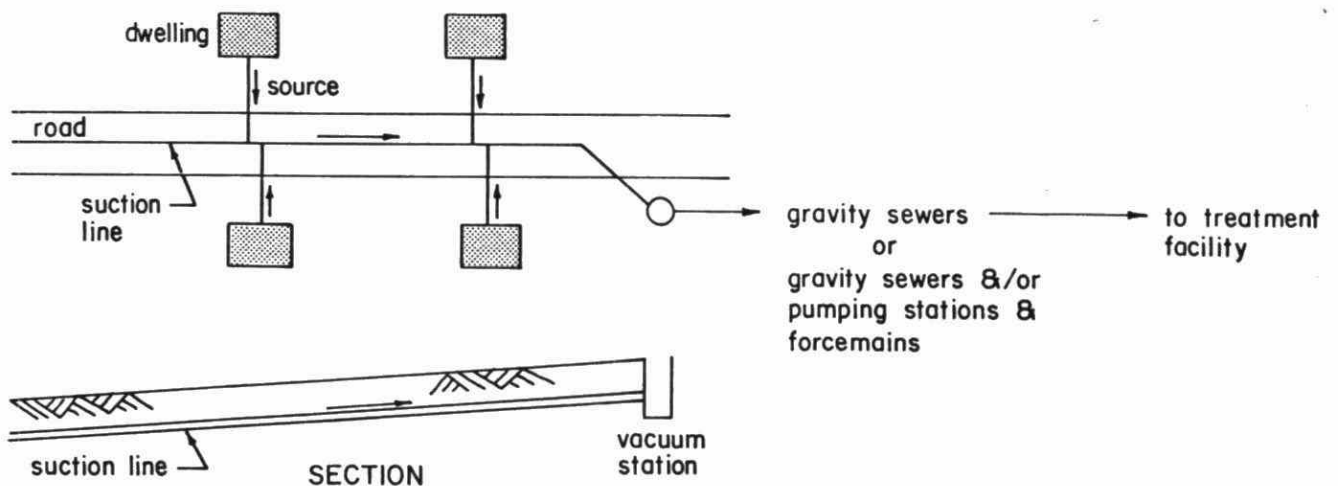
In the smaller plants the entire process usually is carried out in one digester, but in larger plants two digesters generally are required to handle the larger volume of sludge, and the process is carried out in two stages. In two-stage operation the primary digester(s) initially receive the raw sludge to begin the process with the contents being agitated. The secondary digester(s) complete the process in a quiescent state.

Sludge Drying Beds:

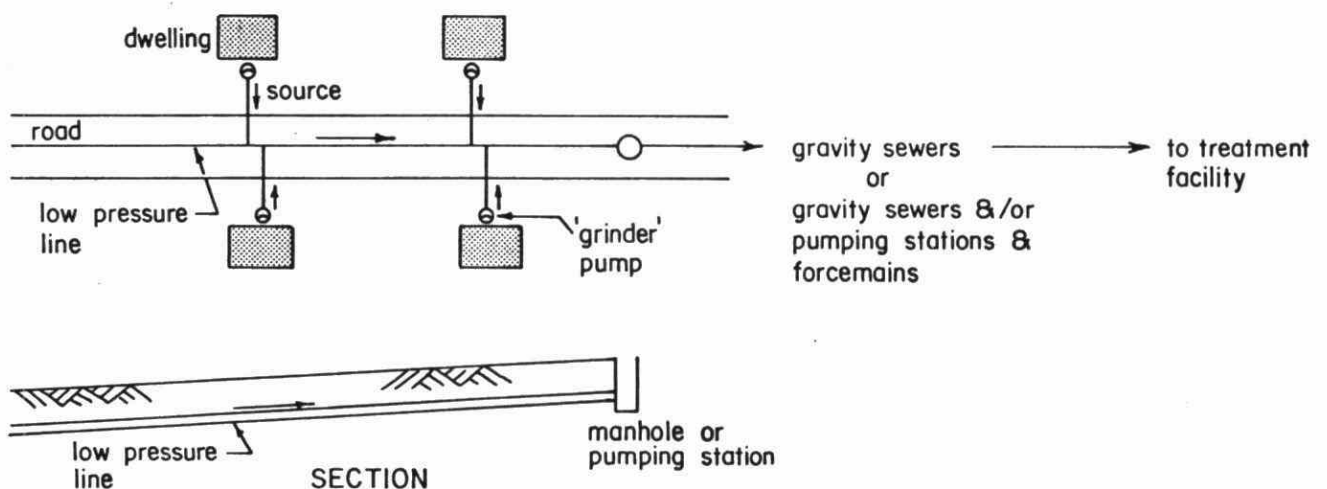
In smaller installations sludge drying beds may provide the means for dewatering.



a. GRAVITY COLLECTION

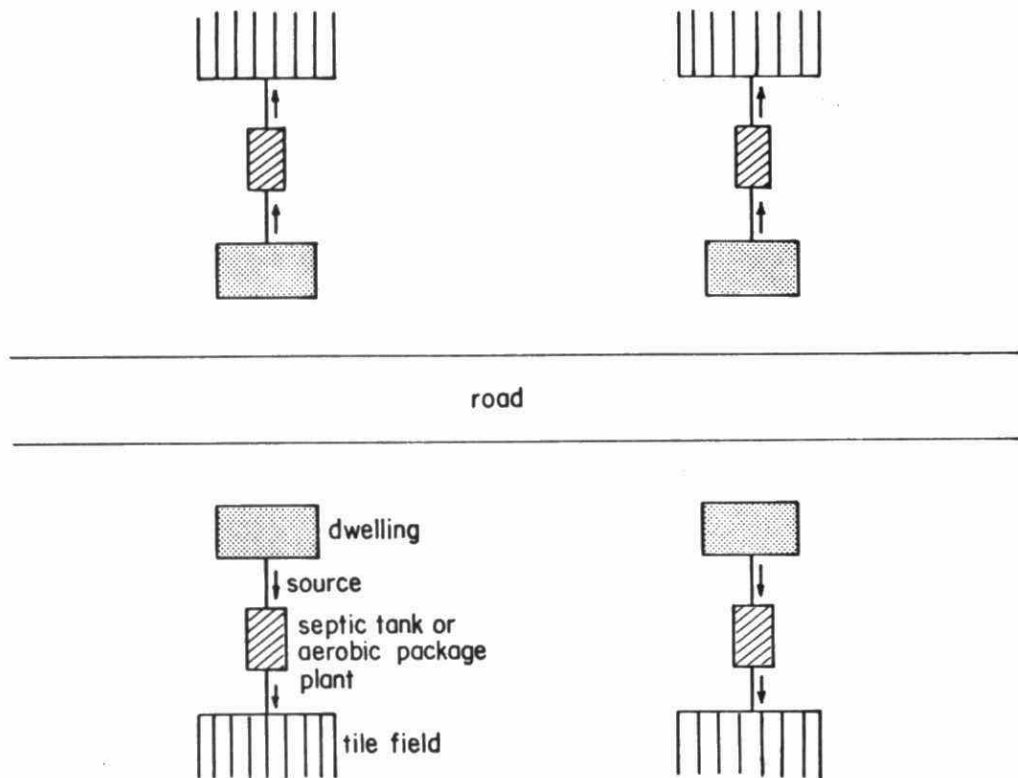


b. VACUUM COLLECTION

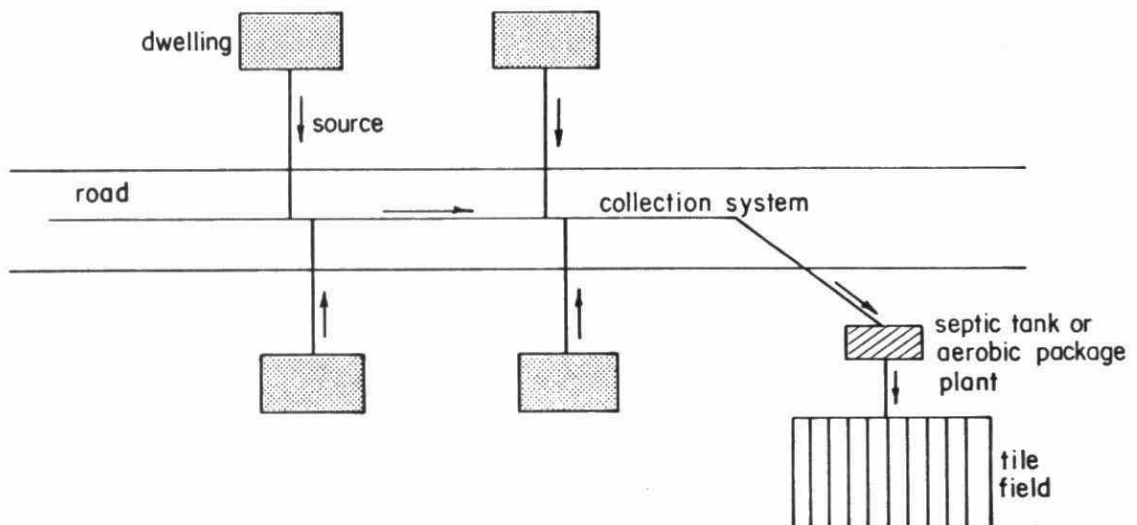


c. LOW PRESSURE COLLECTION

SEWAGE COLLECTION FACILITIES

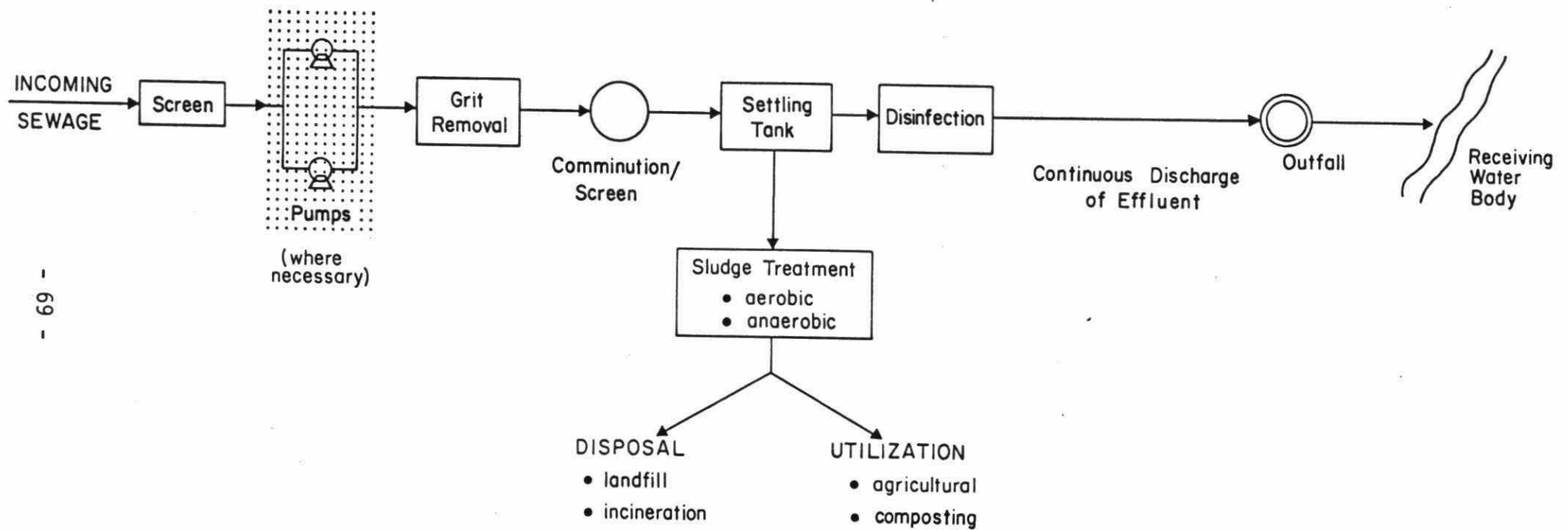


INDIVIDUAL TREATMENT & SUBSURFACE DISPOSAL SYSTEM



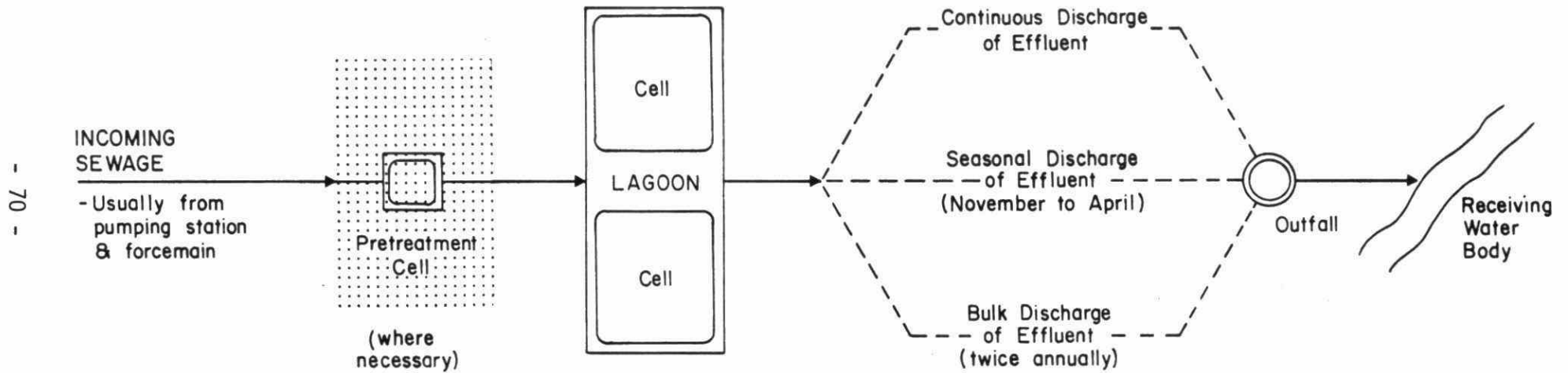
COMMUNAL TREATMENT & SUBSURFACE DISPOSAL SYSTEM

PRIMARY TREATMENT FACILITY



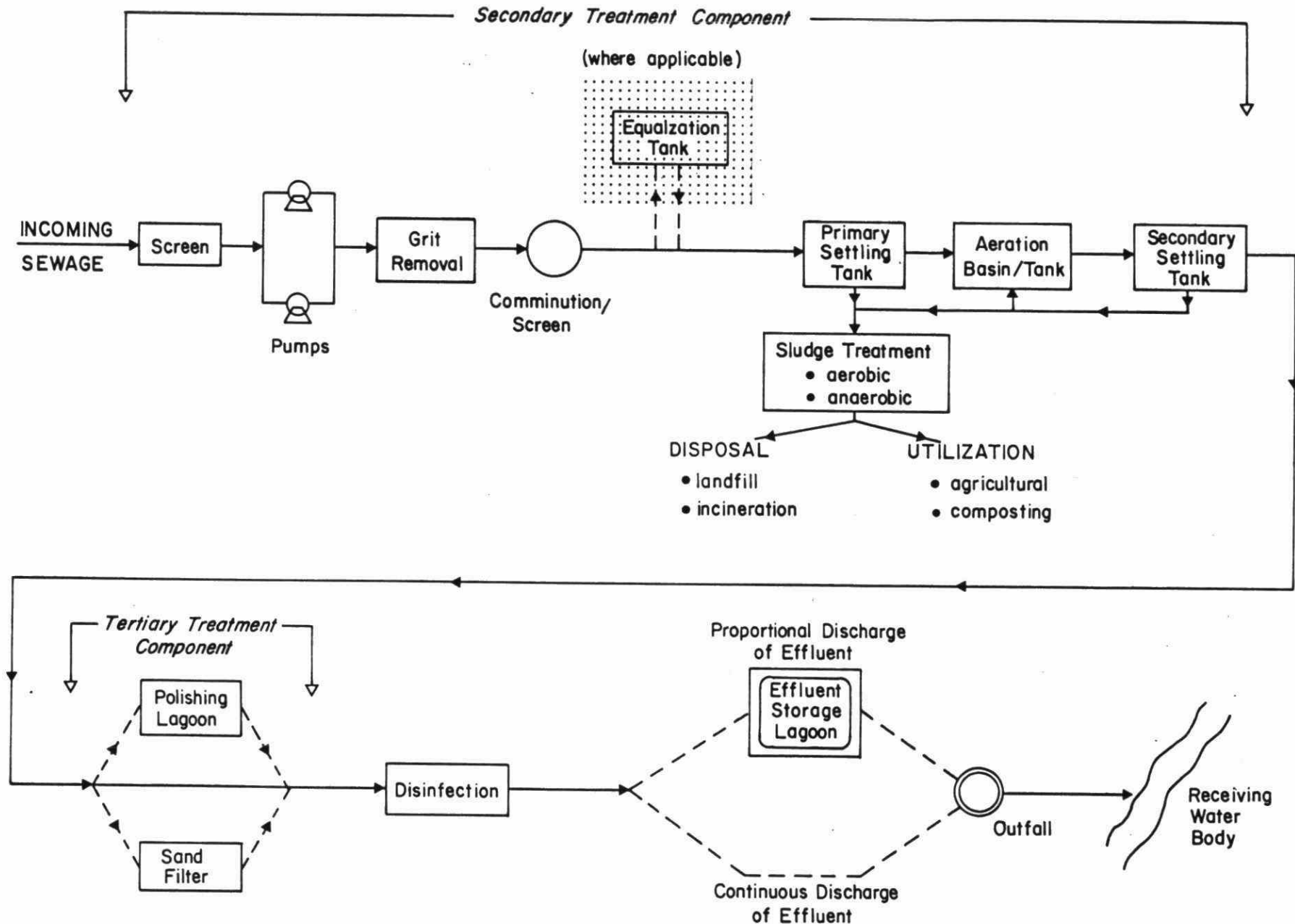
Note: This diagram illustrates the typical major components of a primary treatment facility. An individual facility may not, however, contain all the components shown or have the components in the order indicated.

TYPICAL LAGOON TREATMENT FACILITY



Note: The lagoon may be aerated with either diffused air or mechanical aeration throughout the whole or a portion of the lagoon or pretreatment cells. The lagoon usually has two or more cells.

SECONDARY & TERTIARY TREATMENT FACILITY



Note: This diagram illustrates the typical major components of a secondary & tertiary facility. An individual facility may not, however, contain all the components shown or have the components in the order indicated.

APPENDIX II

ENVIRONMENTAL CONSIDERATIONS FOR THE CONSTRUCTION OF PROVINCIAL SEWER AND WATER PROJECTS ONTARIO MINISTRY OF THE ENVIRONMENT, FEBRUARY, 1977

EQUIPMENT FUELLING, MAINTENANCE AND STORAGE

1. Where?

- a) Equipment fuelling and maintenance shall be done in such a manner that no fuel or oil can gain access to surface water or groundwater.

2. Cleanup of Spills:

- a) There shall be a plan and the means available for the interception and rapid cleanup and disposal of spillages (land and/or water) that do occur. Any spills causing impairment to the natural environment must be reported to the local MOE District office immediately. (See Appendix I & O.W.R. Act)

3. Cleaning Equipment and Disposal of Construction Debris:

- a) The cleaning of equipment in streams and lakes and the emptying of fuel, lubricants and pesticides into watercourses is prohibited. All construction debris must be contained and disposed of in an approved location.
- b) Construction equipment shall be cleaned prior to entering public roadways.
- c) Construction equipment shall not be cleaned where the debris can gain access to storm sewers or watercourses.

4. Equipment and Material Storage:

- a) All equipment and materials shall be stored in an orderly manner and in locations acceptable to the Ministry.

5. Exhaust:

- a) Exhaust emissions from equipment should be minimized through efficient machine maintenance.

WATERCOURSE CROSSINGS

1. Preparation for Crossings:

- a) Before any construction at a crossing begins, all equipment and backfilling material to be used must be on site and ready for placement. The time from excavation to restoration shall be kept to a minimum.
- b) The nearest District Offices of MNR and MOE and the local Conservation Authority shall be notified two working days prior to the commencement of any crossings.

2. Vegetation Removal:

- a) The removal of vegetation from the slope approaches to the watercourse shall be kept to the minimum necessary for construction.
- b) Aquatic weeds uprooted or cut prior to or during trenching operations must be contained and adequately disposed of on land in a manner and location acceptable to the Ministry.

3. Culvert Installation for Temporary Stream Crossings:

- a) Culvert installations should be made on existing natural grade with minimum possible disturbance to the channel and the culvert should project well beyond the fill area.
- b) The inlet and outlet of the culvert shall be protected against erosion.
- c) The design features of all culverts shall ensure that there is no scouring of the stream bed or banks.
- d) The culvert shall not restrict peak flow.
- e) The culvert shall not restrict the movement of migrating fish.
- f) When no longer required the crossing shall be removed and the site restored to its original condition.

4. Diversion Channel:

- a) If a diversion channel is required, it shall be suitably stabilized before the stream is diverted.
- b) The diversion (including slope protection) must be completed before the stream is diverted. Only then may the original channel be blocked off.

5. Excavation:

- a) Unless the excavated material from the bed of the watercourse is suitable for backfilling the trench, it should be removed and deposited on land where it will not regain access to watercourses. Disposal shall be at a site, approved by the engineer.
- b) Work in the stream will be scheduled to avoid fish migration, spawning or egg incubation periods.
- c) No pretrenching shall be undertaken.

6. Backfilling:

- a) Clean, approved, granular material must be available on site prior to trenching and must be used to cover the pipe as soon as it is laid across the watercourse.
- b) Cut-off walls shall be used to avoid the creation of an artificial drain effect in the trench (french drain).

7. Stabilization:

- a) The stream banks and bed that have been disturbed by construction must be stabilized immediately after construction to prevent erosion.

8. Vehicular Movement:

- a) The number of points at which heavy equipment may cross the river will be restricted and at no time shall the stream bed be used as a vehicle or equipment route.

9. Site Grading and Drainage:

- a) Action must be taken to ensure that the trench adjacent to the crossing is not flooded with surface runoff that would result in a discharge of turbid water to the watercourse.

AGRICULTURAL LAND

1. Notice to Owner:

- a) Adequate notice of the schedule (timing and location) of the movement of materials and construction activities and normal maintenance and repairs should be given to the landowner and occupant.

- b) The use of herbicides and pesticides must be coordinated with the Regional Pesticides Control Office and the landowner and occupant.

2. Field Tiles and Agricultural Drains:

- a) It is essential to repair and/or replace tile drainage systems to their original condition. All open drains and ditches must be properly repaired utilizing appropriate soil stabilization procedures.
- b) Tile drains that are cut during the trenching operation shall be maintained to prevent the entrance of debris and silt into the drainage system, and to accommodate the free flow of water through the system.

3. Topsoil Removal:

- a) Topsoil must be stripped and stockpiled separately before trenching begins. Excess excavated material, stones, construction debris, trees, and brush must be disposed of in a manner acceptable to the landowner and the Ministry of the Environment.

4. Compaction of Topsoil:

- a) Compaction shall be minimized and where compaction of topsoil does occur, it will be necessary to relieve this compaction before leaving the site.

5. Topsoil Replacement:

- a) Topsoil must be replaced last and revegetated in a manner compatible with the soils and existing land uses.

6. Access Across Trench:

- a) Where requested, an access route must be available to the landowner to cross the right-of-way and easement or temporary work area during all phases of construction so as not to inhibit normal movement of equipment or animals.
- b) Care must be taken to protect livestock from being injured by any phase of construction.

7. Fences:

- a) It is necessary to repair or replace fences that are opened, removed or damaged, to their previous condition unless otherwise specified.
- b) Where the cutting of wire fences is necessary, it shall

be done in such a manner as to prevent loss of tension on the remaining fence sections.

NOISE CONTROL

1. Noise By-Laws:

- a) All local noise by-laws must be recognized and adhered to.

2. Mufflers:

- a) All vehicles and equipment shall be equipped with efficient muffling devices to minimize noise levels in the project area.

3. Noise Attenuation:

- a) Where necessary, noise attenuating devices (barriers) shall be placed around stationary pumps and compressors.

DUST AND PARTICULATE CONTROL

- a) Dust control measures shall be undertaken to prevent dust nuisances resulting from any phase of the construction operation.
- b) Permitted dust control measures may include the application of calcium chloride, oil or water. In general, the use of calcium chloride and oil shall be minimized and restricted to vehicle rights-of-way. In close proximity to watercourses, more frequent water applications shall be used.

CLEARING RIGHTS-OF-WAY

1. Vegetation Removal:

- a) Grubbing shall not be carried out prematurely but shall only be done in advance of the immediate construction phase.
- b) Prior to clearing any vegetation adjacent to or within the construction site, trees that are to be saved shall be marked for protection and fenced around the dripline, or as directed by the engineer.

2. Soil Storage:

- a) Topsoil shall be stripped from the area to be disturbed by the construction operation and shall be stockpiled so that it may be replaced following construction. It is important to keep the topsoil separated from the subsoil.
- b) Stockpiled material must be located away from watercourses.
- c) Stockpiled material must be stabilized to prevent erosion.
- d) Any excavated material that is not used as backfill shall be disposed of in an approved manner. At no time shall excess fill be deposited in floodplain areas, watercourses, or around the base of trees.

SITE DRAINAGE AND EROSION CONTROL

1. Drainage to Pipe Trenches:

- a) Site grading or other measures shall be taken to prevent runoff water from draining into the pipe trench.

2. Use of Vegetation Strips:

- a) Vegetation strips shall be maintained between the construction easement and watercourses.

3. Containment of Surface Runoff:

- a) Provisions shall be made to intercept and divert site drainage, at short distance intervals, into natural channels, infiltration ditches, settling ponds or permeable ground cover depending on quality and quantity of runoff.
- b) Appropriate sediment retention measures shall be incorporated in the work to ensure that sediment discharge to watercourses in or adjacent to the working area is minimized.

WORKING AREA DELINEATION

- a) The boundaries of the working area shall be delineated through the use of stakes or snow fencing.
- b) Snow fencing shall be placed between the construction easement and watercourses, marshes, trees and shrubs that are to be protected.

DEWATERING

- a) Prior to any dewatering, a water level survey of the closest wells should be conducted. If the amount of dewatering is equal to or exceeds 10,000 gpd (i.e., 20 gpm for eight hours) a Water Taking Permit must be obtained from the Regional Water Resources Section of the Ministry of the Environment.
- b) All water from dewatering operations is to be discharged to settling ponds unless otherwise specified by this Ministry.

GROUNDWATER AND WELLS

- a) A water level survey of wells in the vicinity of the trenching operations should be carried out prior to construction.
- b) A plan for compensation (i.e., immediate delivery of water) shall be worked out ahead of time in order to minimize the delay should it be necessary to provide water for a landowner.
- c) Landowners whose wells are affected by construction practices (i.e., dewatering operations and/or the release of groundwater) shall be compensated accordingly. Landowners experiencing temporary interference shall have water made available to them until groundwater conditions return to normal. Landowners experiencing permanent interference shall have their water supply restored in a suitable manner (i.e., new well or deep well pump or extension of a municipal service). If well interference occurs in a water service area, only temporary provisions of water supplies would be required. Permanent restoration would be the landowner's responsibility.

TREE MAINTENANCE

1. Protection:

- a) All trees that are to be retained must have snow fencing placed around the dripline of the tree. The snow fencing must not be placed against the trunk of the tree.
- b) No heavy machinery is to pass inside of the dripline of trees that are to be saved.

2. Removal of Limbs:

- a) Any limbs that are removed shall be sawed off flush to the trunk and painted with a dressing approved by the engineer.

3. Repair of Damage:

- a) Any scars caused by machinery shall be repaired and painted with an approved dressing.

4. Stockpiled Material:

- a) Any material placed around the base of trees shall be removed immediately by hand.

5. Removal of Dead Trees and Slash:

- a) Any shrubs or trees killed by the construction operation shall be removed from the construction site, and disposed of in a location approved by the engineer.

SITE RESTORATION

1. Restoration Plan:

- a) A restoration plan will be established prior to initiation of construction.

2. Timing:

- a) Restoration should follow immediately behind construction.
- b) If the weather does not permit full restoration, then interim stabilization will be carried out until such time as restoration is possible.

3. Final Grade and Compaction:

- a) Final grades should be close to what the initial grades were prior to construction unless otherwise specified.
- b) Proper compaction of backfill must be achieved to prevent settling.

4. Seeding and Reentering the Area:

- a) At no time should machinery reenter an area other than a roadway after restoration has been carried out, unless further restoration is done.

5. Temporary Roads:

- a) Temporary roads shall be removed and restored as soon as construction activities will permit.



Ontario

MINISTRY OF THE ENVIRONMENT

YORK - DURHAM
SEWAGE SYSTEM

STANDARD DOCUMENTS
FOR THE
CONSTRUCTION OF
SEWERS

THIRD EDITION

JULY 1978

SECTION 1B - ENVIRONMENTAL CONSIDERATIONSGeneral

(1B.1)

It is intended
that the works

proposed be executed in such a manner which, to the fullest possible extent, minimizes any adverse effects on the cultural and natural environment of the project area. The environmental conditions of the contract stated herein must be complied with in all respects. It is a responsibility of the Contractor that all his personnel be sufficiently instructed so that the work is carried out in a manner consistent with minimizing environmental insult. Contractors are informed that the Ministry may assign full or part-time on-site inspectors whose sole responsibilities are to ensure compliance with environmental objectives.

This section outlines the general requirements of the environmental considerations, and will be specified in more detail as required in the special clauses of these documents.

Refuelling Areas

(1B.2)

The Contractor
shall undertake

a detailed review of his proposed route of construction to plan access routes and fuelling areas. Refuelling and maintenance of equipment shall not be undertaken in or adjacent to watercourses. Suitable fuelling and maintenance areas shall be established and all maintenance and fuelling conducted in these areas. The locations of such areas are subject to approval by the Engineer. Procedures for the interception and rapid clean-up and disposal of spillages that do occur shall be submitted to the Engineer for review prior to starting work. All materials required for cleanup of fuel spillages shall be maintained readily accessible on site.

The exception to this fuelling location requirement shall be generators, cranes, backhoes or shovels which may be fuelled at other than the designated fuelling areas. However, no fuelling of backhoes shall be carried out within thirty metres of any watercourse. This requirement may be relaxed at the discretion of the Engineer if non spill fuelling facilities are used.

Clearing of Vegetation

(1B.3)

Prior to clearing
of vegetation

the route of the proposed works shall be examined to identify significant environmental features which must be maintained. Particular attention shall be given to any natural wildlife habitats located within the working areas. Trees which can be preserved shall be protected by snow fencing or equivalent placed around the drip line. The Engineer shall designate on

the Drawings and shall identify in the field those natural environmental features within the working limits which must be preserved. If deemed necessary by the Engineer, the Contractor shall erect, maintain and remove snow fence in order to protect these areas.

In general, clearing and grubbing shall be kept to a minimum. Vegetative cover shall be removed only slightly in advance of actual sewer construction. Clearing and grubbing shall be performed in the manner stated herein or as shown on the Contract Drawings.

<u>Stockpiles</u>	(1B.4)	Stockpiles of a semi-permanent nature, e.g. topsoil, excess excavated material, shall be located and protected to ensure minimum environmental interference.
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Stockpiles of this type shall be covered with plastic sheeting and perimeter drainage ditches shall be constructed to intercept and divert runoff to adjacent settling ponds.

Specific attention must be given to the locating of stockpiles or other fills in or near tree stands, along flood plains and in areas containing natural wildlife habitats. The destruction of tree roots or other vegetation by unnecessary cutting during construction or by the placing of excessive fill in tree stand areas, or by compaction due to heavy equipment will not be permitted.

<u>Sediment Basins & Settling Ponds</u>	(1B.5)	Appropriate sediment retention measures shall be incorporated in the work to ensure that sediment discharge to water courses in or adjacent to the working area is minimized. These may include sedimentation ponds to which pumped water or run off is directed prior to discharge to adjacent watercourses. Refer also to Clause 2B-10. Dewatering Excavations.
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The overflow rate from settling or sedimentation ponds shall be such that the solids carry over is minimum. The Contractor shall incorporate straw bales, filter berms or sand bags as required to retard and filter run-off prior to discharge to watercourses.

Settling ponds or silt traps shall be excavated as required from time to

time. This re-excavation shall be conducted in such a manner that sediments are not introduced into adjacent watercourses.

In general, concentrated run-off from unstabilized areas shall be intercepted and diverted to stabilized areas under sheet flow conditions. Any water pumped for the purposes of trench excavation or dewatering shall be directed to a settling basin or other device to reduce suspended solids content prior to discharge to a storm sewer or natural watercourse.

The inspection and cleaning as required of protective devices shall be carried out regularly. Clogged filter materials such as crushed stone or straw bales shall be replaced as required by the Engineer.

Sensitive Areas,
Stream Crossings
and Channel Diversions

(1B.6)

Encroachment
or unique

natural areas must be avoided. Habitats of rare or endangered species should not be disturbed, and wetland sites used as feeding or breeding areas by migratory waterfowl, or as habitats for other animals, should be protected.

The timing of the construction in sensitive areas must be such that there will be minimal interference with water uses including fish migration or spawning, or disruption of the incubation period of the eggs.

Wherever temporary weirs, dams, or stream diversions are required, adequate stream flow must be provided to avoid interference with downstream water uses.

All temporary stream crossings, weirs or dams must be preceded by the construction of containments built of jute bags filled with sand. In the case of crossings, the upstream and downstream ends of the crossing area will have the containments set before fill material is introduced.

Should the anticipated duration of the containment be longer than three months, a dry mix of one part cement to five parts sand shall be employed to fill the jute bags.

In general, channelization, permanent diversion of watercourses, and watercourse crossings shall not be allowed.

The Engineer must be informed in writing of the particular schedule for each river crossing or channelizing and any other work in designated sensitive or temporary areas.

If a diversion channel is required it shall be excavated and stabilized with suitable materials such as gravel or granular material prior to any diversion of the stream taking place.

Prior to the re-direction of the stream to its original course, the banks and river beds must be satisfactorily compacted and stabilized and rip-rapped over disturbed river bed.

Subsequent to the re-direction, the diversion channel must be filled in and stabilized.

Removal of vegetation from the slope approaches to the watercourse should be kept to a minimum. Aquatic plants uprooted or cut prior to or during trenching operations must be contained and deposited on land.

The number of points that heavy equipment crosses a watercourse should be restricted, and at no time should the stream bed be used as a route.

Final stream channel cleanup must include removal of any temporary structures, re-shaping of the stream to an approved configuration, protection of the stream banks as specified herein and/or shown on the Drawing and removal of all construction materials and debris as required.

Restoration-General

(1B.7)

In general, the entire site

shall be restored to a state equal or if specified elsewhere to a condition better than existing conditions.

Restoration shall not be undertaken as a final project task but shall be initiated as soon as backfilling and compaction activities have been completed.

Temporary roads shall be removed as soon as construction activities can permit and the vegetative cover shall be restored to its original condition by replanting of natural cover all as specified herein or indicated on the Drawings.

Noise & Dust Control

(1B.8)

All vehicles
and equipment

shall be equipped with efficient muffling devices to minimize noise levels in the project area. In particular, construction equipment such as compressors, gas and diesel driven engines, pavement breakers shall be equipped with efficient mufflers.

The Contractor shall establish and maintain site procedures consistent with the objective that noise levels from the construction area shall be minimized, and in accordance with local bylaws.

In areas where some permanent installations, such as tunnel shafts, are required other devices such as artificial barriers, berms etc. shall be used to minimize noise levels.

The Contractor shall undertake all dust control measures to prevent dust nuisances resulting from any phase of his operation. Dust control practices shall be carried out at all locations on site or on adjacent roads.

Permitted dust control measures include the applications of calcium chloride, oiling or water. In general the use of calcium chloride and oil shall be minimized, particularly in close proximity to watercourses, and more frequent water applications shall be used. No chemical means of dust control shall be initiated without prior approval by the Engineer.

The transporting of excessively dusty materials such as cement must be carried out in covered haulage vehicles.

Protection of Trees

(1B.9)

The Contractor
shall be respon-

sible for the protection of tops, trunks and roots of existing trees on project site that are to remain. Existing trees subject to construction damage shall be fenced around the drip line before any work is started. Wherever possible, do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks and cover scars immediately with an approved tree wound dressing.

Where excavating, filling or grading is required within the branch spread of trees that are to remain, the work shall be performed as follows:

Trenching - When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots. Any roots over 25 mm which are damaged, shall be treated immediately with tree paint.

Raising Grades - When the existing grade at the tree is below the new finished grade, and fill not exceeding 400 mm is required, clean washed gravel graded from 25 mm to 50 mm size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 450 mm and finish approximately 50 mm above the finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill.

Lowering Grades - Trees marked for preservation that are located above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Exposed or broken roots shall be cut clean and covered with topsoil.

Trees potentially undermined by trench construction shall be braced to unaffected trees by means of cables and turnbuckles, for the period of open trench construction.

All trees outside the working easement, or those within the working easement and designated to be protected shall be protected from construction activity.

Any such trees which, in the opinion of the Engineer, have been damaged beyond repair by the Contractor's activity shall be replaced by the Contractor at his expense with trees of a similar size and species, or such size and species as may be approved by the Engineer. These trees shall be subject to the period of maintenance as outlined in Clause 29 of the General Conditions.

APPENDIX III
TYPICAL CONDITION CHANGES IN THE ENVIRONMENT
CAUSED BY CONSTRUCTION ACTIVITIES, EXPANDED FACILITIES
AND FACILITY OPERATION

The following charts illustrate the typical environmental condition changes which may be associated with expansion and/or upgrading projects in this Class. Condition changes can occur to various aspects of the social as well as the natural environment. The condition changes may have beneficial and/or adverse consequences.

Normally, only a few, if any, of these changes, would be related to a particular undertaking in this Class, depending, of course, on the specifics of that project. The charts will assist the personnel responsible for the design and construction of the projects in this Class as they illustrate the range of changes that may be associated with the project. The purpose of the charts is to point out that the personnel responsible for design and construction of projects in this Class must be aware of the 'holistic' concept of the environment as expressed in The Environmental Assessment Act and of the interrelationships of natural and social environmental conditions.

VARIOUS SEWAGE SYSTEM COMPONENTS

TYPICAL CONDITION CHANGES IN THE ENVIRONMENT CAUSED BY
CONSTRUCTION ACTIVITIES, EXPANDED FACILITIES AND FACILITY OPERATION

	SEWER PIPES & PUMPING STATION	TREATMENT FACILITY	OUTFALL	LAND TREATMENT	INCINERATION	SLUDGE DISPOSAL	SLUDGE UTILIZATION (AGRIC.)	TILE FIELD
<u>SURFACE DRAINAGE</u>								
- diversion and/or channelization of watercourses	*	*	*	N/A	N/A	N/A	N/A	N/A
- decreased flood storage capacity through placement of structures and fill material in floodplain	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- contamination of surface waters directly or through runoff by chemical spills and leaks	*	*	*	*	N/A	*	*	*
- contamination of surface watercourse by blasting bedrock formations containing soluble toxic materials	*	*	*	N/A	N/A	N/A	N/A	N/A
- sedimentation and turbidity of adjacent water bodies due to construction activities	*	*	*	N/A	N/A	N/A	N/A	N/A
- "ponding" effects on adjacent properties due to natural drainage disruption	*	*	N/A	N/A	N/A	*	N/A	N/A
- increased surface runoff from new impermeable surfaces, saturated soils, etc.	*	*	N/A	*	N/A	*	N/A	*
<u>GROUNDWATER</u>								
- truncation of shallow aquifers and springs	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- contamination of groundwater by blasting bedrock formations containing soluble toxic materials	*	*	N/A	N/A	N/A	N/A	N/A	*
- changes in groundwater quantity, e.g. groundwater interference at producing wells due to de-watering procedures	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- altered groundwater quality (land treatment, sludge disposal/ utilization)	*	*	*	*	*	*	*	*
<u>SOILS/GEOLOGY</u>								
- erosion of cut slopes, stockpiles and fill materials prior to stabilization	*	*	*	N/A	N/A	N/A	N/A	N/A
- slumping of encroached slopes	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- deposition of sediment on adjacent properties	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- contamination by heavy metals, petrochemicals etc. in soils	*	*	N/A	*	N/A	*	*	*
- mixing of topsoil with subsoil	*	*	*	N/A	N/A	N/A	N/A	*
<u>Topography/Landforms</u>								
- "scarring" of unique landforms	*	*	N/A	N/A	N/A	N/A	N/A	N/A
<u>Climatic Features</u>								
- effect of vegetation removal on snow accumulations adjacent to the facility	*	*	N/A	N/A	N/A	N/A	N/A	*
- removal of vegetation causing reduction of "windscreen" effect on adjacent buildings or activities	*	*	N/A	N/A	N/A	N/A	N/A	*
- change in air quality through addition of particulants, gases, unpleasant odours	N/A	*	*	*	*	*	*	N/A
<u>AQUATIC FISH, WILDLIFE AND VEGETATION</u>								
- modification or removal of existing aquatic habitat including the displacement of plants and animals which may serve as food supply or shelter for other species	*	*	*	N/A	N/A	N/A	N/A	N/A
- changes in water quality of nearby surface water having value as wildlife habitat	*	*	*	*	N/A	*	*	*

VARIOUS SEWAGE SYSTEM COMPONENTS

TYPICAL CONDITION CHANGES IN THE ENVIRONMENT CAUSED BY
CONSTRUCTION ACTIVITIES, EXPANDED FACILITIES AND FACILITY OPERATION

	SEWER PIPES & PUMPING STATION	TREATMENT FACILITY	OUTFALL	LAND TREATMENT	INCINERATION	SLUDGE DISPOSAL	SLUDGE UTILIZATION (AGRIC.)	TILE FIELD
AQUATIC FISH, WILDLIFE AND VEGETATION (Cont'd)								
- effects of timing of construction activities on spawning and breeding periods	*	*	*	N/A	N/A	N/A	N/A	N/A
- lowering of water table resulting in stress to riparian vegetation	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- introduction of warmer water from ponds into colder surface water-courses resulting in stress to some fish species	N/A	N/A	*	*	N/A	N/A	N/A	N/A
- production of new aquatic habitats during construction from pits and depressions	*	*	*	N/A	N/A	N/A	N/A	N/A
- changes in water quality status of existing habitats (e.g. nutrients)	*	N/A	*	*	N/A	*	*	*
TERRESTRIAL VEGETATION AND WILDLIFE								
- planting of new vegetation consisting of exotic species thus creating an artificial plant community	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- mortality/stress of vegetation due to damage by construction equipment to sediment deposition or changes in soil moisture conditions, resulting in reduction and/or deterioration of wildlife habitat	*	*	*	N/A	N/A	N/A	N/A	*
- creation of new wildlife habitat by site restoration	*	*	*	N/A	N/A	N/A	N/A	N/A
- changes in vegetative composition as a result of environmental changes	*	*	N/A	*	*	*	N/A	N/A
- removal or disturbance of significant trees and/or ground flora	*	*	N/A	*	N/A	*	N/A	*
- possible effects of accumulated heavy metals and other contaminants on vegetation and wildlife	N/A	N/A	N/A	*	N/A	*	*	N/A
- new or increased exposure of forest edge with resultant effects of windthrow of trees leading to increased loss of habitat for wildlife	*	*	N/A	N/A	N/A	*	N/A	*
- changes in nutrient status of existing habitats	N/A	N/A	*	*	N/A	*	*	*
<u>Heritage Resources</u>								
- disruption and/or destruction of sites and structures having significant archeological, historical or architectural values	*	*	*	*	*	*	*	*
- disruption, destruction or deterioration of sites or structures having significant archeological, historical or architectural values, as a result of environmental condition changes such as increased air pollution, altered water table, vibration, etc.	*	*	*	*	*	*	N/A	+
- unwanted increase in public access and potential vandalism of areas with heritage values	*	*	N/A	N/A	N/A	N/A	N/A	*
- threatened viability of or opportunity for retention of sites with heritage values due to changes in setting character resulting in decreased social significance being accorded to site	*	*	*	*	*	*	N/A	N/A
<u>Agricultural</u>								
- removal of productive farmland	*	*	N/A	*	N/A	*	N/A	*
- disruption of field access from public roads	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- disruption of farm machinery and animal movements on roads accessing the treatment facility	N/A	*	N/A	N/A	*	*	*	N/A
- disturbance of livestock by noise and dust during construction	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- disruption of tile and surface drainage systems	*	*	N/A	N/A	N/A	N/A	N/A	*

VARIOUS SEWAGE SYSTEM COMPONENTS

TYPICAL CONDITION CHANGES IN THE ENVIRONMENT CAUSED BY
CONSTRUCTION ACTIVITIES, EXPANDED FACILITIES AND FACILITY OPERATION

	SEWER PIPES & PUMPING STATION	TREATMENT FACILITY	OUTFALL	LAND TREATMENT	INCINERATION	SLUDGE DISPOSAL	SLUDGE UTILIZATION (AGRIC.)	TILE FIELD
<u>Agricultural (Cont'd)</u>								
- adverse effects of sludge containing heavy metals and other chemicals, bacteria, and virus from runoff, areas of sludge disposal, and spray irrigation on crops, livestock, and people	N/A	N/A	*	*	N/A	*	*	N/A
- loss of property may lead to reduced viability of individual farm operation	*	*	N/A	*	N/A	*	N/A	*
- higher crop yield on lands used for spray irrigation and sludge disposal	N/A	N/A	N/A	*	N/A	N/A	*	N/A
- degradation of water quality affecting irrigation and/or livestock watering as well as general farmstead water use	N/A	N/A	*	*	N/A	*	*	*
- reduction of water quantity available for agricultural uses - vegetation, livestock watering and general farmstead use	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>Residential</u>								
- effects on safety and movement patterns of pedestrian traffic where residences are adjacent or in proximity to a treatment facility or located along arterial road routes used for trucking sludge to disposal/utilization sites	N/A	*	N/A	N/A	N/A	*	*	N/A
- temporary disruption during construction (inconvenience, noise, dust, detours, etc.)	*	*	*	N/A	N/A	N/A	N/A	N/A
- effects of physical changes in use of residential property due to property loss	*	*	N/A	N/A	*	*	N/A	*
- effects on property value due to expansion of system components	*	*	*	*	*	*	*	*
- financial and social stresses on, or benefits to residents relocating due to removal of homes	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- effects of improving collection and treatment of sewage from residential sources	*	*	N/A	N/A	N/A	N/A	N/A	*
<u>Institutional (e.g. school, hospital, church, senior citizens' home)</u>								
- effects on safety and movement patterns of pedestrian traffic where institutional uses are adjacent to or in proximity to treatment facility or along arterial road routes used for trucking sludge to disposal/utilization sites	N/A	*	N/A	N/A	*	*	*	N/A
- temporary disruption of institutional activities during construction (inconvenience, noise, dust, detours, etc.)	*	*	*	N/A	N/A	N/A	N/A	N/A
- effects of physical changes in layout on institutional use due to removal and/or relocation	*	*	N/A	*	N/A	*	N/A	*
<u>Commerce and Industry</u>								
- effects on safety and movement patterns of pedestrian traffic where such uses are adjacent to or in proximity to a treatment facility or located along arterial road routes used for trucking sludge to disposal/utilization sites	N/A	*	N/A	N/A	N/A	*	*	N/A
- temporary business disruption during construction (inconvenience, noise, dust, detours, etc.)	*	*	*	N/A	N/A	N/A	N/A	N/A
- effects of physical changes in layout of business uses due to property loss	*	*	N/A	N/A	*	N/A	N/A	N/A
- effects on business viability and operation due to removal and/or relocation	*	*	N/A	N/A	N/A	N/A	N/A	N/A

VARIOUS SEWAGE SYSTEM COMPONENTS

TYPICAL CONDITION CHANGES IN THE ENVIRONMENT CAUSED BY
CONSTRUCTION ACTIVITIES, EXPANDED FACILITIES AND FACILITY OPERATION

	SEWER PIPES & PUMPING STATION	TREATMENT FACILITY	OUTFALL	LAND TREATMENT	INCINERATION	SLUDGE DISPOSAL	SLUDGE UTILIZATION (AGRIC.)	TILE FIELD
<u>Outdoor Recreation</u>								
- effects on environmental conditions in a recreation area due to changes in accessibility to the open space area and/or linkages to the community or other open space areas due to expansion of treatment facility or collection system	*	*	*	*	N/A	*	N/A	*
- temporary disruption of open space activities during construction (inconvenience to users, maintenance problems, noise, dust, etc.)	*	*	*	N/A	N/A	N/A	N/A	N/A
- effects of physical changes in layout of recreation uses due to property loss	*	*	N/A	*	N/A	*	N/A	*
- effects on operation of public recreation program due to removal of recreation area	*	*	N/A	*	N/A	*	N/A	*
- effects on quality of user experience due to changes caused in environmental quality	*	*	*	*	*	*	*	*
<u>Aesthetics</u>								
- removal of vegetation	*	*	N/A	N/A	N/A	*	N/A	*
- effect of stream improvements or culverting	*	*	*	N/A	N/A	N/A	N/A	N/A
- change in scale of facility relative to landscape	*	*	N/A	*	N/A	N/A	N/A	N/A
- adjacent residents exposed to new view	*	*	N/A	*	*	*	*	*
- buffer areas around facility decreased	*	*	N/A	*	N/A	N/A	*	*
<u>Community Disruption</u>								
- loss of tax base due to removal of business(es)	*	*	N/A	N/A	N/A	N/A	N/A	*
- loss of employment opportunities due to removal of business(es)	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- disruption of social ties between different parts of a community or its services due to removal of buildings, homes, businesses etc.	*	*	N/A	N/A	N/A	N/A	N/A	N/A
- effects on community's perception of community well-being and 'quality of life' afforded resulting from disruption or removal of features valued by the community, e.g. views, trees, swimming area	*	*	*	*	*	*	*	*
- social effect of improving level of sewage collection and treatment services	*	*	N/A	N/A	N/A	N/A	N/A	*
<u>Noise and Vibration</u>								
- changes in existing noise and/or vibration levels due to expanded operation of facility and/or expansion of facility area closer to or further away from homes, institutional uses, buildings of historic or architectural significance, etc.	*	*	N/A	N/A	N/A	*	*	N/A
<u>Public Health</u>								
- effects on the physical, chemical and microbiological quality of existing groundwater supplies by changes in the biological regime in areas of spills, spray irrigation and sludge disposal	*	*	*	*	N/A	*	*	*
- effects of changes on the groundwater elevations on existing subsurface sewage disposal systems	*	N/A	N/A	*	N/A	N/A	N/A	*
- effects on the physical, chemical and microbiological quality of surface water bodies used for water contact recreation/water supply	*	*	*	*	N/A	*	*	*
- effect of increased particulant or chemical air pollutants on the public	N/A	N/A	N/A	N/A	*	N/A	N/A	N/A
- effects of reduced system failure, e.g. less frequent backup of sewage into basements	*	*	N/A	N/A	N/A	N/A	N/A	*

APPENDIX IV
TYPICAL REMEDIAL MEASURES FOR
ADVERSE ENVIRONMENTAL CONDITION CHANGES

INTRODUCTION

The following sections describe some typical adverse environmental condition changes and their possible resolution. The purpose of this appendix is to provide an indication of the types of measures that can be taken to *mitigate* various adverse impacts and to illustrate where/when these measures could be applied.

What actually would be done on any particular project would depend on such considerations as the nature and location of the project, the characteristics of the local environment, the effectiveness of the measures in engineering and environmental terms and costs. The following subsections therefore, serve only as a general guide to the personnel responsible for design and construction of a project in this Class. Specific environmental concerns will, of course, be identified in the appropriate design stages and documented, along with mitigation measures and construction requirements, in the Environmental Study Report for a project.

In addition to this appendix, the responsible project personnel will consult and refer to various policy statements and guidelines of the Ministry of the Environment and of other agencies. The specific policy statements and guidelines to be utilized will depend on the specifics of the expansion and/or upgrading project under consideration and will also change over time as new guidelines are issued and existing ones modified.

It is important to note that an environmental impact may vary in terms of its *type, duration, reversibility and severity*. Sample definitions of these four factors are included in this appendix prior to the discussion of remedial measures. All of these factors and also the *social significance* and *social values* attached to various impacts, must be taken into account by the responsible project personnel in designing a project in this Class.

SAMPLE DEFINITIONS OF THE CHARACTERISTICS OF ENVIRONMENTAL CONDITION CHANGES OR IMPACTS

Impact Type

Direct Impacts

Direct or primary impacts are those associated with straightforward "cause and effect" relationships, e.g., land clearing for construction causes loss of vegetation.

Indirect Impacts

Indirect or secondary effects are less obvious and may be a second order "cause and effect", such as loss of vegetation results in an elevated groundwater table, but not of a second order associated with the project.

Synergistic Impacts

Various condition changes may result in synergistic impacts in that individually the condition changes may be relatively unimportant but together they form impacts which are "greater than the sum of their parts", e.g., the cumulative effect of minor construction activities on water quality and quantity of a water body.

Duration of Impacts

Short Term

Short term impacts refer to construction induced impacts which last only as long as construction or may be non-construction activities which occur briefly during the operation of the facility.

Long Term

Long term impacts refer to impacts which last the life time of the project or past the construction phase, past the initial activity or action phase, or for the duration of maintenance and operation of the project.

Reversibility of Impacts

Irreversible

Some impacts may result in irreversible changes. The commitment to use non-renewable resources may be irreversible. Accidents may also cause irreversible damage.

Reversible

Those impacts which can be kept to an acceptable minimum or easily

rectified before serious damage occurs by applying special mitigating measures are termed reversible impacts.

Severity of Impacts

Moderate and Severe Impacts

Moderate and severe effects are gradations of adverse impacts. Moderate could be characterized as partial elimination, dislocation, impairment, or alteration of biota or use of resources and facilities. Severe could be characterized by total elimination, dislocation, impairment, or alteration of biota or use of resources and facilities.

TYPICAL REMEDIAL MEASURES FOR ADVERSE ENVIRONMENTAL CONDITION CHANGES

This appendix illustrates, in general terms, measures which can be implemented to mitigate various adverse impacts which may result from implementation of an expansion or upgrading project. These measures are not project-specific and serve only as a general guide for reference of the personnel responsible for design and construction of projects in this Class.

The specific remedial measures required for a particular undertaking will be developed during the design process for that project, detailed in the Environmental Study Report and incorporated into the construction specification documents.

TYPICAL REMEDIAL MEASURES FOR ADVERSE ENVIRONMENTAL CONDITION CHANGES

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Surface Drainage System</u>		
Sedimentation and turbidity of adjacent water bodies	- erosion control measures	During construction on slopes and drainage channels
	- sediment traps	Collect sediment before entering drainage channel
	- staging work	During biologically critical periods
"Ponding" effects on adjacent properties due to natural drainage disruption	- appropriate use of culverts, porous back-fill and tile drains	In new construction projects and expansion
Streambank erosion from diversion and/or channelization of watercourse	- erosion control measures	River crossings, outfall construction
Contamination of surface waters through runoff, spills and leaks	- provision for spill control	As a general practice and particularly in vicinity of water bodies, wetlands
	- fast and accurate reporting of spill	
	- spill containment	
	- stockpile materials or devices for spill control	
	- avoid adverse soil conditions	
	- monitor facility for leaks	
Through blasting, expose rocks containing soluble minerals that could potentially contaminate surface water supply, i.e. sulfate, lead, arsenic	- subsurface investigation, i.e. geochemical analysis of bedrock	Areas of shallow soil over relevant bedrock type (normally occurring in Canadian Shield)
	- avoid blasting in areas containing toxic minerals	
Changes in volume of surface runoff	- use design measures to minimize increase in surface runoff	New impervious surfaces
Changes in flood storage capacity by placing fill and structures in floodplain	- avoid placing fill and structures in floodplain or compensate elsewhere	Construction and expansion within river valleys

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Groundwater</u>		
Through blasting, expose rocks containing soluble minerals that could potentially contaminate groundwater, e.g. sulfate, lead, arsenic	- subsurface investigation, i.e. geochemical analysis of bedrock - avoid blasting in areas containing toxic minerals	Areas of shallow soil over bedrock
Truncation of shallow aquifers and springs	- hydrogeologic investigation to identify such areas in advance	Excavations
Reduced groundwater quantity through construction dewatering	- avoid groundwater users and water-bearing formations (soils) - proper dewatering techniques	Truncation of shallow aquifers and spring by groundwater utilization
Spills or leaks resulting in contamination of groundwater supply	- construction refueling precautions - landfilling precautions - operation and storage precautions at treatment facility/pumping station	Near watercourses and on site generally
Drainage of wetland areas resulting in a reduced groundwater contribution to surface water bodies	- avoid wetland areas - utilize appropriate backfill material, i.e. highly permeable backfill is unsuitable	Trenching, excavating, placing fill
Reduced surface water recharge to groundwater particularly in soils with high infiltration characteristics	- restrict extent of impervious surfaces in zones of high infiltration	Subsurface barriers, i.e. foundations, sewage lagoons, areas of impervious surfaces, i.e. parking lots, compaction of soil
Impedence of groundwater movement	- maintenance of the existing groundwater flow regime through engineering design	Dewatering, i.e. in foundations and trenches

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Soils/Geology</u>		
Erosion by wind and water	- revegetation - stage work - avoid highly erodible soils - stabilize slopes: - compaction - chemical stabilizers - gravel blankets - seeding - sodding	Erodible soils in excavations, cut and fill areas Stockpiles, cut slopes
Slumping of encroached slopes	- avoid potentially unstable slopes - mechanical stabilization methods - revegetation (only effective once the root infrastructure has developed) - restrict dewatering near slopes	Steep slopes Cut slopes Removal of the toe of a slope during construction Dewatering
Rockfall hazard	- buffer zone - initiate rockfall at potential failures	Blasting Steep weathered slopes
Loss of aggregate and mineral resources	- avoid sites of aggregate and mineral reserves - extract aggregate and minerals prior to construction	Zones of economic aggregate and mineral occurrence
Contamination by heavy metals, petrochemicals, etc. in soils	- remedial measures to avoid spills and leaks - land application of residential sludge only - incineration of sludge	For STP's and collection systems Agricultural land application Industrial sludge
Contamination of topsoil with subsoil	- stripping and stockpiling of topsoil and stabilization	Generally in areas of undisturbed soils
<u>Topography/Landforms</u>		
"Scarring" of unique features	- avoid unique features	Designation of unique feature, i.e. landmark
<u>Climatic Features</u>		
Removal of vegetation causing reduction of windscreen effect on adjacent buildings or activity	- retain as much vegetation as possible - avoid vegetated areas in close proximity to buildings or activity areas - restore vegetation as soon as possible	Construction in close proximity to buildings or activity areas

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Climatic Features (cont'd)</u>		
Change in air quality from added particulants, gases and odours	- use of air pollution control measures	STP's and incinerators
<u>Aquatic Fish, Wildlife and Vegetation</u>		
Introduction of warmer water from ponds into colder surface watercourse	- appropriate selection of ponding site - infiltrate into ground-water system	Dewatering of trench and excavations Sediment traps
Modification or removal of aquatic habitat Displacement of plants and animals	- stage work to non-critical times - restore stream substrate - choose suitable site for stream diversion	During construction, e.g. river crossings, and dewatering of excavations
Reduced water quality of nearby surface water having value as wildlife habitat	- provisions for spill control - fast and accurate reporting of spill - spill containment - stockpile materials or devices for spill control - avoid adverse soil conditions - monitor for leaks and overuse of disposal systems - minimize tree removal	STP's, collection system, various diverse disposal facilities for effluent and sludge
Timing effects of construction on spawning and breeding periods	- staging of work to avoid spawning and breeding periods	For stream crossings and diversions
Lowering of water table resulting in reduced contribution to streams and stress on riparian vegetation	- design to maintain existing groundwater flows - restrict extent of impervious surfaces in zones of high infiltration	Dewatering of trench and excavations Areas of newly created impervious surfaces
Increased nutrient status of existing habitats	- provisions for spill control - landfilling precautions	Near watercourses and on site generally

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Aquatic Fish, Wildlife and Vegetation (cont'd)</u>		
Drainage of wetland areas causing mortality or stress to animals and possible changes in species composition.	- maintain existing groundwater regime - avoidance of wetland areas - utilize appropriate backfill material, i.e. highly permeable backfill is unsuitable	Trenching or excavating
Siltation to surface watercourses resulting in "smothered" plants and animals due to deposition of silt and increased turbidity to surface watercourses	- utilize suitable backfill material - trench drainage should be discharged to settling areas before being permitted to enter surface water bodies - erosion control measures - staging of work	Trench constructions Intakes, outfalls Erodible soils, stockpiles
Pressure on biological communities	- consider the carrying capacity of the local natural environment	Water and sewage services allow enhanced municipal/population growth. This increases stress on recreational and natural resources.
Tree removal will affect the amount of sunlight reaching waters and affect plant productivity and increase watercourse temperatures	- avoid tree removal near surface water bodies	Stream crossings
<u>Terrestrial Vegetation and Wildlife</u>		
Introduction of exotic plant species through erosion control measures and restoration	- use annuals which later die out - use indigenous (native) species only	On slopes and other areas to control erosion In any disturbed area requiring restoration work
Mortality/stress of vegetation due to sediment deposition, resulting in reduction or deterioration of wildlife habitat	- sediment control measures	Down slope from eroding areas during construction

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Terrestrial Vegetation and Wildlife (cont'd)</u>		
Changes in vegetative composition as a result of loss of topsoil and subsoil or mixing	- restore site by replacing soil in preconstruction horizons	In eroding areas during construction, stockpiles
Removal or disturbance of significant trees and/or ground flora	- avoid these areas - employ tree protection measures	During construction phase of any project
Effects of accumulated heavy metals and other contaminants on vegetation, having possible deleterious effects on wildlife	- planning consideration of sludge disposal sites - improved sewage effluent - operation and storage precautions at treatment facility/pumping station	At point of sludge disposal/utilization and of effluent discharge Sludge disposal sites
New or increased exposure of forest edge with resultant effects of windthrow, leading to increased loss of habitat for wildlife	- avoid woodlots and similar areas	During construction phase of any project
Mortality/stress due to changes in soil moisture conditions, resulting in loss of wildlife habitat	- avoid poorly drained areas - use of appropriate backfill materials - revegetate using indigenous species able to survive new conditions	During construction of sewers
<u>Heritage Resources</u>		
Deterioration of sites or structures having archaeological, historical or architectural values, as a result of environmental changes	- employ necessary steps to decrease harmful environmental condition changes such as air pollution, vibration, altered water table, etc.	Where appropriate with respect to archaeological, historical or architectural resources
Unwanted increase in public access and potential vandalism	- fence off area of concern - prevent public access	Where appropriate with respect to archaeological heritage resources

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Heritage Resources (cont'd)</u>		
Threatened viability of or opportunity for retention of sites with heritage value	- avoid these areas	Where appropriate with respect to archaeological heritage resources
<u>Agricultural</u>		
Removal of productive farmland	- design facilities so as to minimize land requirements and construction disturbance; rehabilitate disturbed areas	In rural areas
Disruption of field access	- provide alternative access points at critical times	In rural areas
Disturbance of livestock by noise and dust during construction	- employ noise and dust control measures	In rural areas
Disruption of tile and surface drainage systems	- stage construction work - restore tile and surface drainage system	In rural areas
Effects on crops of contaminants from runoff and sludge disposal sites	- monitor sludge content to control amount of contaminants being disposed of on farms	In rural areas
<u>Residential, Institutional, Commerce and Industry</u>		
Disruption of pedestrian movements between adjacent uses	- maintain continuity of pedestrian walkway system as much as possible	As general practice
	- provide walkway strips to adjacent residential areas	Where suitable
	- provide crosswalks and sidewalks at access points	Where suitable
Expansion facilities inconsistent with or disrupt character of area	- preserve existing amenities as much as possible	As general practice
	- landscape access points, vicinity of structures, buffer areas	Where suitable

<u>Environmental Concern</u>	<u>Remedial Measure</u>	<u>Application (Where/When)</u>
<u>Residential/Institutional, Commerce and Industry (cont'd)</u>		
Expansion facilities inconsistent with or disrupt character of area (cont'd)	- design and site structures to blend with adjacent building forms and materials	As general practice
	- grade site area to pleasing lines, utilize berms	Where suitable
Temporary disruption during construction and/or inconvenience to users of adjacent properties and building	- notify public agencies and adjacent owners of construction scheduling	Where substantial inconvenience or disruption to adjacent uses would be experienced and where measures would substantially reduce effects
	- prepare 'emergency program' to ensure quick resolution of servicing problems	
	- consult with public agency and/or adjacent landowners regarding temporary access re-routing	As general practice
	- schedule construction so as to minimize period of disruption in proximity of adjacent uses and structures	
Removal of residences and other buildings within expansion area	- coordinate removal program to minimize inconvenience	As general practice
<u>Outdoor Recreation</u>		
Temporary disruption of open space activities during construction	- employ noise and dust control measures - staging of construction to cause least disruption	In areas within or adjacent to public open space
Effects of physical changes in layout of recreation uses due to property loss	- compensate elsewhere	In areas within or adjacent to public open space

<u>Environmental Concern</u>	<u>Remedial Measures</u>	<u>Application (Where/When)</u>
<u>Aesthetics</u>		
Removal of vegetation	- restore area to pre-construction conditions	In all areas of construction
Construction and culverting in watercourse valleys	- restore all disturbed areas to as natural a condition as possible	As general practice, where applicable
Adjacent residents exposed to new view	- design new structures to blend in with existing environment	In all areas of construction
Dust during construction	- control dust on site by such methods as watering, limiting exposed areas, etc.	Where adjacent uses or natural vegetation could be adversely affected
<u>Community Disruption</u>		
Community perception of condition changes occurring	- ensure all remedial work undertaken in keeping with community objectives and perception of community features	As general practice
<u>Noise and Vibration</u>		
Increased noise levels during construction	- ensure contractor abides by municipal Noise Control Bylaw	Construction supervision
	- utilize special noise reduction equipment on construction machinery	Where substantial noise level increases will be experienced affecting adjacent uses and where substantial attenuation is possible
	- limit construction period to day time hours	
Increased noise levels from treatment facility and/or pumping station	- reduce noise levels e.g. insulate treatment facility, install noise barriers or berms, plant vegetative screening, enlarge buffer area	Where substantial noise level increases will be experienced affecting adjacent uses and where substantial attenuation is possible

<u>Environmental Concern</u>	<u>Remedial Measures</u>	<u>Application (Where/When)</u>
<u>Public Health</u>		
Exhaust emissions from construction equipment and vehicles	- minimize operation on site, control location on site	Where adjacent uses or natural vegetation could be adversely affected
Particulant matter and gaseous emissions from treatment facility (e.g. sludge incineration)	- modify design of facility - review operational practices	Where appropriate
Odour causes public nuisance, e.g. lagoon	- modify design by adding aeration equipment	Where appropriate
Effects of groundwater elevation on existing subsurface sewage disposal systems	- monitor groundwater levels and, if necessary, take appropriate action	Where appropriate
Groundwater contamination	- construction refueling precautions - landfill design and operation precautions - precautions in operation and storage at treatment facility, pumping station	On site generally

APPENDIX V

GLOSSARY OF TECHNICAL TERMS

COMBINED SEWER

A sewer intended to carry surface runoff, sewage and industrial wastes allowed by sewer bylaws.

DRY WEATHER FLOW

The combination of domestic sewage and industrial and commercial wastes found in sanitary sewers during the dry weather season of the year.

ENVIRONMENTAL CONDITION CHANGE/ENVIRONMENTAL EFFECT

This is a change in the existing conditions of the environment, both social and natural, which may have beneficial (positive) and/or adverse consequences.

EROSION

The processes by which the ground surface is worn away by the action of wind and water. Also the process by which the bed and banks of a stream are worn away by the action of water.

EUTROPHICATION

The progressive enrichment of surface waters particularly non-flowing bodies of water such as lakes and ponds, with dissolved nutrients, such as phosphorus and nitrogen compounds, which accelerate the growth of algae and higher forms of plant life and result in the utilization of the usable oxygen content of the waters at the expense of other aquatic life forms.

EXFILTRATION

The escape of water from a water main, or sewage from a sewer, into sub-surface materials due to a break, leaks, etc., in the pipe.

FLOODPLAIN

The flooded ground along the stream course which is covered by water at flood stage.

FRONTAGE ASSESSMENT CHARGES

Lump sum payments required for linking individual residences or other structures into water mains or sewers. These charges are typically based on the length of 'street frontage' of the individual lot.

GROUNDWATER

That portion of the subsurface water in the zone of saturation below the water table.

IMPERVIOUS

Not permitting penetration or passage of water or other liquids.

INFILTRATION

The passage of water into the soil. The term is also used to refer to the water entering the sewer system through points such as defective pipes, pipe joints, connections and manhole walls. It includes all extraneous water such as groundwater and surface water, but does not include normal sewage inflow.

MITIGATING OR REMEDIAL MEASURES

Measures that are incorporated into the project, that are intended to reduce, eliminate or ameliorate the negative consequences of an adverse environmental condition change.

POLLUTANT

Dredged soil, solid waste, incinerator residue, sewage, garbage, sludge, chemical wastes, biological materials, radio-active materials, heat, wrecked or discarded equipment, rock, sand, dirt and industrial, municipal and agricultural waste discharged into water.

PRIMARY TREATMENT

Processes or methods for the treatment of sewage and other wastes intended for the removal of suspended and settleable solids by gravity and sedimentation. It provides no changes in dissolved and colloidal matter in the sewage or wastes flows.

ROOF DRAIN

A drain or pipe that conducts storm water from the roof of a structure, downward and into a sewer for removal from the property, or onto or into the ground for seepage disposal of runoff.

RUNOFF

That portion of the precipitation on a drainage area that is discharged from the area into stream channels.

SANITARY SEWER

A sewer which carries sewage and those industrial wastes permitted by sewer use bylaws.

SECONDARY TREATMENT

Processes or methods for further treatment of sewage and other wastes, usually following primary treatment, to obtain additional improvement in the quality of the treated wastes.

SEDIMENT

Soils or other surface materials transported by wind or water as a result of erosion.

SEDIMENTATION

The process of deposition of suspended matter carried by water, sewage, or other liquids, by gravity.

STORM SEWER

A sewer which carries storm water and surface water, street wash and other wash waters or drainage, but excludes sewage and industrial wastes.

SURCHARGE

The flow condition occurring in closed conduits when the sewer is pressurized or the hydraulic grade line is above the crown of the sewer.

TERTIARY TREATMENT

Process or method for the supplemental treatment of sewage and other wastes which result in additional improvement in the quality of the treated wastes than is achieved by conventional secondary treatment.

WATER TABLE

A surface or point of transition between the zone of aeration and the zone of saturation.

WATER TREATMENT/WATER PURIFICATION

Those processes by which 'raw' water is treated to remove bacteria, and possibly algae, colour and suspended material in order to meet the minimum water quality objectives for human consumption.

WET WEATHER FLOW

A combination of dry weather flows, infiltration and inflow which occurs as a result of rain and storms.

APPENDIX VI

RELEVANT PROVINCIAL ACTS AND REGULATIONS
ADMINISTERED BY THE MINISTRY OF THE ENVIRONMENT
AND
RELEVANT POLICY STATEMENTS AND GUIDELINES
OF THE MINISTRY OF THE ENVIRONMENT

Provincial Acts and Regulations

1. The Environmental Assessment Act, 1975
2. The Environmental Protection Act, 1971
Ontario Regulation 824 - Waste Disposal
Ontario Regulation 229/74 - Sewage Systems
3. The Ontario Water Resources Act, 1970
Ontario Regulation 648/70 - Water wells

Policy Statements and Guidelines

1. *Environmental Considerations for the Planning and Construction of Provincial Sewer and Water Projects*, Environmental Assessment Section, Environmental Approvals Branch, Ontario Ministry of the Environment, February, 1977.
2. *Evaluating Construction Activities Impacting on Water Resources*, Water Resources Branch, Ontario Ministry of the Environment, January, 1976.
3. *Chlorination of Potable Water Supplies*, Technical Bulletin 65-W-4, Sanitary Engineering Branch, Ontario Ministry of the Environment, Revised September, 1973.
4. *General Guidelines for the Preparation of Environmental Assessments*, Environmental Assessment Section, Environmental Approvals Branch, Ontario Ministry of the Environment, July, 1978.
5. *Guidelines for Sewage Sludge Utilization on Agricultural Lands, Preliminary Draft*, submitted by Joint Ministerial Committee of the Ontario Ministry of Agriculture and Food, Ontario Ministry of the Environment, Ontario. Ministry of Health. April, 1979.
6. *Model Municipal Noise Control By-law, Final Report*, Noise Pollution Control Section, Pollution Control Branch, Ontario Ministry of the Environment, August, 1978.

7. *Permit to Take Water Program, Policy and Procedures Manual*, Water Resources Branch, Ontario Ministry of the Environment, 1974.
8. *Policy for Waste Water Disposal by Irrigation*, Pollution Control Branch, Ontario Ministry of the Environment, April, 1977.
9. *Policy Regarding the Assessment of Lots for their Suitability for Sewage Disposal Systems Under Part VII, The Environmental Protection Act, 1971*, Pollution Control Branch, Ontario Ministry of the Environment, December, 1978.
10. *WATER MANAGEMENT - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment*, Ontario Ministry of the Environment, November, 1978.

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